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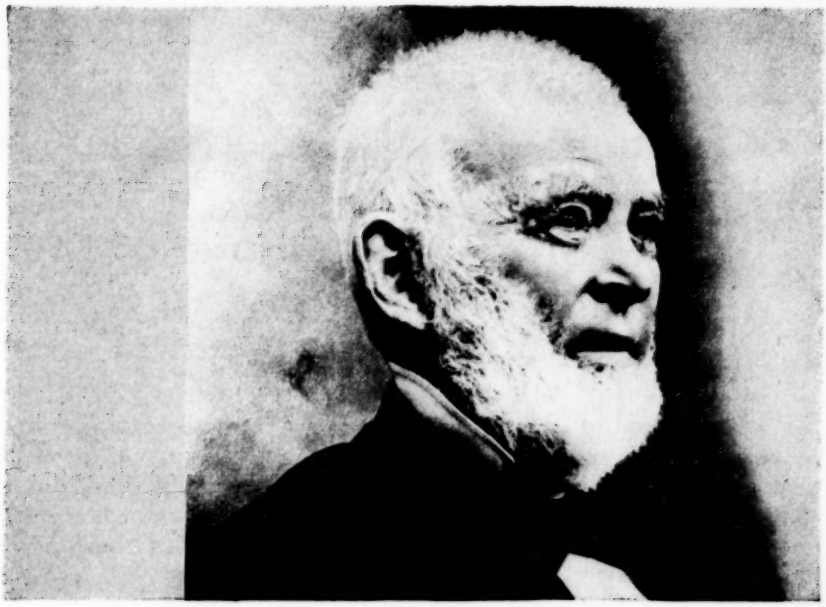
The Journal of the American Association of Nurse Anesthetists is published quarterly by the American Association of Nurse Anesthetists, 116 S. Michigan Ave., Chicago 3, Ill. Entered as second class matter, May 14, 1945, at the post office at Chicago, Ill., under the act of March 3, 1879. Address all communications relative to editorial and advertising matters to the Editor, 116 S. Michigan Ave., Chicago 3, Ill. Subscription prices: to members, 50c a year; to nonmembers and institutions $1.50 a year; single copies, 50c. The opinions expressed in the columns of the Journal are those of the contributors and are not to be construed as reflecting the views of the American Association of Nurse Anesthetists.



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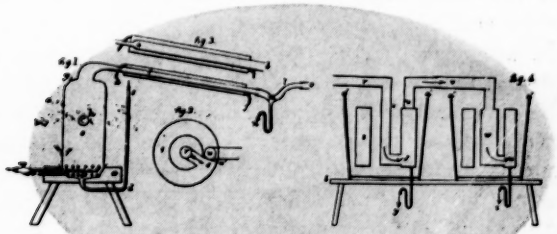

Diagrams for Early Ether Still from "Apparatus for the Preparation of Ether by Steam" Edward R. Squibb, M.D., The Journal of American Pharmacy, Sept. 1856.

Opinion Review

What Should the Attitude of the Schools Be Towards the Accreditation Program?

The accreditation program should come as a great and welcome relief to the schools of anesthesia. It is the beginning of an advanced training program, which has long been planned and looked forward to. The schools, after the first shock of realizing that there is some outside help available to them in settling many of their problems, will welcome this consultation and aid.

I think we should welcome the accrediting advisor and association member as we would receive any other "visiting fireman" with a kindred interest. It is usual to try to make as good an impression as possible. In a busy anesthesia department it is impracticable to endeavor to put on a special demonstration the day of the inspection. This is hardly necessary anyway, as the challenge of any busy day is sufficient demonstration for the visitors to judge the quality of the school, students, instructors, and other members of the anesthesia staff.

It perhaps should even be heartening to the older anesthetists to know that many students have criticisms and suggestions about how routine and emergency situations should be handled. At least the student is thinking. Perhaps these same students will be willing to put in the long and, many times, adventurous hours as graduates to assist in teaching more nurse anesthetists. Recruits to the teaching field in anesthesia would find plenty of work to keep them interested.

Many times an interested person from outside an institution is able to give valuable assistance in helping to solve a school's problems, for example, by emphasizing to the administration that, while the student is to receive practical experience and must therefore work, she is not to be exploited for the amount of work she is able to do, without sufficient supervision. The student in turn should be made to realize that she must develop her anesthesia judgment whenever there is an opportunity, or she will always be dependent and thereby be limiting her ability. A good nurse anesthetist with good judgment

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and an average amount of tact has a bright future to look forward to.

I think the accreditation program should be of assistance to the schools of anesthesia in carrying their already heavy burden of training more and better nurse anesthetists. The need of the anesthesia field today is good anesthesia service. Our efforts should be directed towards the accomplishment of this goal primarily. Any other interpretation of the accreditation program, I believe, is adverse to the original intention of the program. Today, more than ever before, the schools of anesthesia should be united in the common cause of producing competent anesthetists.

The crying need still is for an anesthetist who can sit down and administer good, safe anesthesia whether it be physician or nurse.—**Frances E. Fanning, R.N.**, University of Michigan Hospital, Ann Arbor.

Degrees for Nurse Anesthetists

After considerable thought about the problem of degree programs for nurse anesthetists and the requirements leading to a degree in anesthesia, I have been somewhat puzzled as to what is meant by a degree in anesthesia. What would be the requirements for such a degree? How and where will the programs be set up? These and many more questions will have to be met and answered.

Whatever may be the plan for establishing degree programs, which in the last analysis will place the practice of anesthesia and the nurse anesthetist on a higher plane of achievement and recognition, it is certainly worth while.

The following advantages are some that, in my opinion, should be considered in relation to degree programs: Owing to the more intense study, the student would get a greater insight into the fundamentals of anesthesia. Naturally, the nurse anesthetist with a degree and the profession as well would receive greater recognition. A greater appreciation of scientific study would come out of this sort of program. Probably the greatest benefit would be that the program would overcome the student's handicap of inadequate preparation for a scientific course of study.

One must not only consider the advantages but one must also give considerable thought to the disadvantages and weigh them in the balance. For example, it would take a longer time for a student to become a full-fledged anesthetist, and it might prove to be an expensive undertaking for the nurse.

My only hope for such a program is that it will not prove too burdensome for the newly graduated nurse. This could be a factor that might discourage many potential candidates for anesthesia studies.—**Philip Kromm, R.N.**, Moscow, Idaho.

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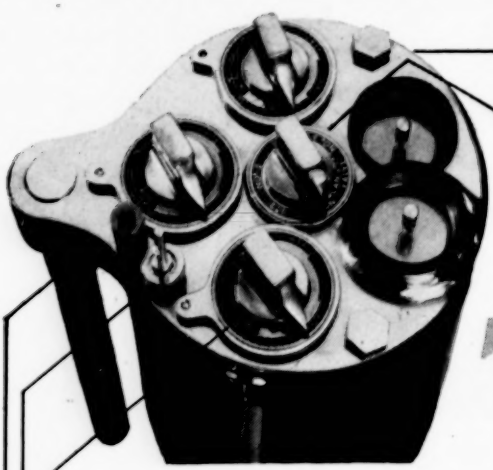

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The Journal OF THE American Association of Nurse Anesthetists

Vol. XX No. 4 November, 1952

The Journal's Policies

A publication can't do a good and proper job for its readers without having their expressions of approbation or criticism. The editors need the stimulation of such comments in order to develop the publication along the lines of reader needs. However, there is one type of query about our procedures that seems to need a published explanation. Occasionally, we hear from readers who wonder why a certain paper read before a meeting of the Association or another contribution is not published. So we'd like to explain our policies with respect to the acceptance and rejection of papers.

The decision not to publish a paper is made jointly by all the editors. A variety of considerations go into the making of this decision. First, does the paper satisfy reader needs or reader interest? Have other articles on the same subject appeared in the JOURNAL or elsewhere in the literature, and, if so, is the subject of sufficient importance for another article on it to be of value? Does the paper say anything that hasn't been said better before? One new idea or an old one freshly and forcibly expressed may mean the difference between acceptance and rejection. Is the procedure described or the technic recommended safe and useful under a variety of circumstances? Or is it sufficiently new and the interest in it sufficiently great for space to be given to it, even though it is not widely applicable? A final consideration with respect to the subject of a paper is whether it will fit into the plan for a particular issue of the JOURNAL. It is not unusual for several articles on the same subject and of similar treatment to be submitted at about the same time, and obviously a choice must be made.

A paper that is well written often, but not necessarily, has a better chance than one that is not. Because it is our business to help get worth while material into proper form for publication, a feebly written paper with good content may be chosen over one that is well written but offers little.

State News Bulletins

As the world shrinks and nations jostle one another, far neighbors become important. Correct and rapid information about them is at a premium.—STEPHEN VINCENT BENET

Thousands of professional bulletins are issued to fulfil the needs of select reader groups. These convey information, stimulate interest, and abound in views, versions, and discussions on every phase of human activity.

All normal persons are interested in others. Most people like to imagine themselves doing or not doing the things that are news, and nurse anesthetists do not differ in this respect. Besides having reasons of a social nature, nurse anesthetists as a professional group are becoming progressively aware of the paramount importance of maintaining contacts to some degree with other members of the profession. The JOURNAL and A.A.N.A. NEWS BULLETIN facilitate that kind of contact on a national level. Not a few state associations have already developed local bulletins or news letters published monthly, bimonthly, or quarterly in accordance with controlling conditions.

Inasmuch as the membership in the state associations is growing, it seems only logical that each state would choose some form of bulletin for the benefit of the members who expect to keep abreast of the latest news at all times. From the messages of officers, reports of committee activities and meetings, and plans for future programs emanates an atmosphere of belonging to a really challenging group.

Usually, the high ideals of the profession are brought out at the conventions of the professional organization and, when the activities are translated in brief onto the pages of a local publication, they disseminate hope and courage along with essential spiritual values to all alike. The benefit is shared and multiplied.

Attractive as the prospect may sometimes seem, we cannot live today on a desert island independently of others. Because our thoughts, words, accomplishments, and even fate affect to a certain extent someone else in the group in which we live and work, it is worth sharing these personal experiences through the medium of a local publication. By kindliness and friendly interest in the sorrows of others, moral assistance is extended at a most needful time.

Items of news value arise from the new, the strange, and the interesting. Bulletins are essentially news organs in that an event is put into "news shape" and displayed in proportion to its relative value and timeliness. It is impossible for some states, especially those which do not have large memberships, to develop a publication of their own; however, the members of a few states may find it expedient to combine forces to print a regional paper or bulletin at stated intervals.—**SISTER M. REGINELLA, R.N.**, St. Mary of Nazareth Hospital, Chicago.

Physiologic Effects of Anesthetics upon the Respiratory System

A Review and Evaluation

V. K. Stoelting, M.D.*
Indianapolis

A brief review of respiratory system physiology is necessary in order to discuss the physiologic effects of modern anesthetic drugs upon the respiratory system.

Control of Respiration

The central nervous system control center of respiration, generally called the respiratory center, is a group of motor nerve cells not sharply demarcated and scattered throughout the formatio reticularis of the medulla. This reticular formation signifies that the nerve cells are not dominated by any one type of influence but serve as a common pathway for nerve impulses. Ranson[1] was able to demonstrate that electrical stimulation of the dorsal portion of the formation in the medulla of cats produced expiration and that stimulation of the ventral portion caused inspiration. Stella[2] revealed that section through the pons produced a slow gasping respiration and, when accompanied by section of vagi, caused respiration to cease completely. It was postulated that a pneumotoxic center existed in the upper pons, which was able to act like vagi in limiting inspiration and allowing expiration to begin.

The most recent studies have conclusively proved that the respiratory center has its own spontaneous activity.[3] This spontaneous activity is primarily dependent upon the inspiratory center. A reciprocal innervation exists between the inspiratory and expiratory centers.

The control of the respiratory center is a complex pattern, and numerous factors are involved. All theories have placed the center under control of a chemical agent — carbon dioxide, oxygen lack, or an increase in acidity of blood perfusing the center. These theories do not completely explain certain common findings, especially the effect of exercise where carbon dioxide may be low and alkalemia present. The sensitivity of the respiratory center to carbon dioxide varies according

Read before the Tri-State Assembly of Nurse Anesthetists, Chicago, April 28, 1952.
*From the Department of Anesthesiology, Indiana University Hospitals.

1. Pitts, R. F.; Magoun, H. W., and Ranson, S. W.: Localization of medullary respiratory centers in the cat. Am. J. Physiol. 126:673-688, 1939.

2. Stella, G.: On mechanism of production and physiological significance of 'apneusis'. J. Physiol. 93:10-23, 1938.

3. Best, C. H., and Taylor, N. B.: *The Physiological Basis of Medical Practice*, ed. 4 (Baltimore: Williams and Wilkins, 1945) pp. 342-350.

to various chemical and reflex influences. The effective concentration of carbon dioxide is within the neurons and not the blood. Gray[4] emphasized the multiple factor theory of control. He stated that a number of agents, both chemical and reflex, exert an independent effect upon respiration, and the net ventilation is determined by the algebraic sum of the partial effects of each separate agent.

In addition to being under intrinsic chemical control, the respiratory center is under the constant influence of afferent impulses from numerous sources. These can be grouped into four types:

I. *Hering-Breuer reflexes.*—Hering and Breuer[5] in 1868 first pointed out that there are nerve receptors in the pulmonary alveolar ducts from which reflex impulses originate when the lungs are inflated. The impulses are carried by way of the vagus to the respiratory center and inhibit inspiration. There are also end organs in the lung that are stimulated by excess deflation and result in stimulation of inspiration; this reflex is present only under pathologic conditions.[6]

II. *Carotid and aortic reflexes.*—Heymans[7] in 1927 revealed the presence of chemoreceptors in the carotid bodies and aortic arch, which are stimulated by oxygen lack. This stimulation sends impulses to the respiratory center by way of the glossopharyngeal and vagus nerves.

III. *Higher nervous control.*—The unconscious control of respiration by voluntary means is shown in numerous activities, such as talking, laughing, coughing, and swallowing. The effect of emotional disturbances via the higher cerebral centers is often pronounced as in fright, anger, and pleasure.

IV. *Reflexes from peripheral body.*—The stimulation of almost any afferent nerve can produce a reflex change in respiration.

Effect of Volatile Anesthetics

In considering the effects of anesthetics upon the respiratory system, one cardinal principle of pharmacology must not be forgotten. Drugs cannot impart nerve function to cells or tissues; they can only stimulate or depress normal cellular activity. This is particularly true of anesthetics whose prime action is depression of the central nervous system.

The physiologic effects of the notable anesthetics may be divided into central and local. The effects of the various stages of anesthesia are so definite in their result upon the respiratory system that, conversely, the variations in type of breathing are used as the most important sign of depth of anesthesia. Indeed, if an anesthesiologist could have only one function to guide his management of anesthesia, certainly he would choose respiration.

Normal breathing is somewhat irregular, owing to psychic and somatic reflexes. As anesthesia is begun, the stage of analgesia is passed and the stage of excitement is entered. Respirations are

4. Gray, J. S.: The multiple factor theory of the control of respiratory ventilation. Science **103**:739-744, 1946.

5. Hering-Breuer: Stizungsber. d. r. Akad. d. Wissen. Wien. II, **57**:672, **58**:909, 1868.

6. Adrian, E. D.: Afferent impulses in the vagus and their effect on respiration. J. Physiol. **79**:332-357, 1933.

7. Heymans, C.; Bouckaert, J. J., and Regniers, P.: *Sinus Carotidien* (Paris: Soin & Cie, 1933).

irregular with frequent breath holding. As the depth of anesthesia is deepened and the stage of surgical anesthesia is reached, respiration becomes regular. The rate is usually increased, and the lag following inspiration is shortened, so that expiration follows inspiration immediately. The tidal volume is increased, and costal respiration becomes greater than diaphragmatic. Second plane anesthesia is marked by a slight decrease in rate of respiration. Tidal volume is decreased to normal, and both costal and diaphragmatic breathing are equal. In third plane anesthesia diaphragmatic breathing is prominent, and the intercostal muscles become weaker and show delayed movements. Inspiration is rapid, and expiration is prolonged. The rate is increased to about thirty per minute, and tidal volume is decreased. The intercostal muscles are completely paralyzed in fourth plane anesthesia. The intercostal interspaces retract with each inspiration, and the rate is increased. The tidal volume is decreased, and the respiratory rate gradually decreases as the respiratory center becomes more depressed. Smaller inspiratory gasps gradually decrease in amplitude until complete cessation of respiration marks the fourth stage of anesthesia. The foregoing classical description of the respiratory changes in various depths of anesthesia is most definite in ether anesthesia.[8]

These changes in type of respiration with depth of anesthesia demonstrate the differences in sensitivity of the various cells of the respiratory center. In quiet easy breathing the external intercostal muscles and the diaphragm are the only muscles functioning. The neurons controlling these muscles have the lowest threshold to chemical stimuli. When greater pulmonary ventilation is needed, chemical stimuli are increased, and the nervous discharge to the external intercostal muscles and diaphragm causes greater contraction of the respiratory muscles. As stimulation increases, cells controlling the accessory muscles of inspiration and expiration begin to discharge impulses until a maximal effort is obtained. Nerve cells with the highest threshold have the greatest resistance to deleterious effects of drugs, anoxia, anemia, and trauma. The disappearance of active expiratory effort is a sign of depression and a warning that further depression will paralyze all of the cells.

The chemoreceptors of the carotid body and aortic arch are stimulated by anoxemia. This reflex center is more resistant than the respiratory center to deleterious effects of anesthetic agents, narcotic drugs, anoxemia, and carbon dioxide retention. Reflex stimulation of the respiratory center by anoxemia must not be allowed to occur for any length of time, or irreparable damage may be done to the brain. Frequently, when oxygen is administered while respiration is being reflexly motivated by anoxemia, apnea will result and confuse the clinical picture. Nevertheless, administration of oxygen must be continued at any cost.

The administration of carbon dioxide to a patient showing signs of narcosis or anoxemia may cause momentary stimulation of respi-

8. Guedel, A. E.: Stages of anesthesia and a reclassification of the signs of anesthesia. Anesth. & Analg. 6:157-163, 1927.

ration. This will only result in an increased demand of the respiratory center for oxygen, which is already at a low level. The result will be momentary stimulation followed suddenly by hypopnea or apnea. The only rational therapy is administration of sufficient oxygen to rejuvenate the center. If the cells of the center are severely depressed by narcosis and anoxemia, they will have lost their power to react to carbon dioxide, and addition of carbon dioxide will result in further depression and cessation of respiration.

Tuohy[9] stressed the clinical importance of the Hering-Breuer reflex in anesthesia. This reflex is most valuable when irritating vapors such as ether, chloroform, and divinyl ether are used and is one important reason why ether is safer than other, less irritating agents. In the conscious patient ether vapor elicits a cough reflex, but in the anesthetized patient only a primitive part of the cough reflex remains. The lungs are thus emptied more rapidly and to a greater extent. The Hering-Breuer reflex operates to increase the rate and depth of breathing in two ways. First, the active expiration produces sufficient emptying of the lungs to stimulate a volley of excito-inspiratory impulses so that inspiration occurs sooner than otherwise. Second, the discharge of impulses from the expiratory neurons by reciprocal innervation inhibits the activity of the inspiratory neurons, and these have a period of complete rest for better recuperation. This resting period is important during anesthesia when the oxidation reactions of cells are depressed. Because of the greater time for recuperation and the more complete emptying of the lungs, the depth as well as the rate of respiration may be increased.

The end result of the active expiratory rhythm of ether anesthesia is to maintain breathing at practically a normal rate in spite of depression. With increased depth of ether narcosis, depth of breathing decreases owing to depression of the center, but early the rate does not change as the center is driven by each Hering-Breuer reflex. The depression of the respiratory center is effectively counteracted and reflex drive continues throughout the safe level of anesthesia to disappear only when depression is severe enough to paralyze the expiratory neurons of the center.

This irritant property of ether vapor is present to a lesser extent in chloroform and is completely absent in the nonirritant gases such as cyclopropane and the nonvolatile narcotics such as avertin and the barbiturates. The degree of respiratory depression for comparable depth of anesthesia is greater with the use of these agents than with the use of ether.

The local effect of the volatile anesthetics upon the respiratory system has been partially discussed in relation to the reflex effect upon the nervous control of respiration. It has been demonstrated[10] upon excised lung tissue that ethyl, divinyl, and cyclopropyl ethers, chloroform, and ethyl chloride are bronchodilators. Cyclopropane, pentothal sodium,

9. Tuohy, E. B.: Respiratory physiologic phenomena during inhalation anesthesia. Arch. Surg. 39:1001-1005, 1939.

10. Adriani, J., and Rovenstine, E. A.: The effect of anesthetic drugs upon bronchi and bronchiolus of excised lung tissue. Anesthesiology 4:253-262, 1943.

morphine, and paraldehyde cause a constrictive action, due to parasympathetic response or to direct irritant action on the bronchi.

Short-Acting Barbiturates

The short-acting barbiturates, with special emphasis on the widely used pentothal sodium, have an unusual specific action on the respiratory system. The agents have a definite parasympathetic action[11] resulting in hyperactivity of the laryngeal reflex, constriction of bronchi and bronchioles, and frequent laryngospasm. As these symptoms are relieved by parasympatholytic and sympatholytic drugs, it is felt that this action is a central vagus stimulation. For this reason premedication with atropine sulfate or scopolamine should always precede barbiturate anesthesia. The danger of severe laryngospasm is the major hazard with pentothal sodium anesthesia and precludes its use where the laryngeal reflex may be stimulated or where an emergency airway with an intratracheal tube cannot be obtained.

Moyer and Beecher[12] showed that under barbiturate anesthesia of increased depth, the respiratory center's sensitivity to carbon dioxide is abolished, and respiration is maintained by the chemoreceptors' being stimulated by anoxemia. This shift of maintenance often is unattended by changes in blood pressure or pulse, and the anesthesiologist has no means of knowing the status of the respiratory control. If a high concentration of oxygen is administered under such conditions, the chemoreceptor reflex will be removed, and complete apnea may occur. These authors stated that many deaths under pentothal sodium anesthesia result in this way.

Spinal Anesthesia

As spinal anesthesia is usually limited to the lower portion of the body, one is likely to forget that it frequently has a pronounced effect upon the respiratory system. Cullen[13] stated: "Pulmonary complications following spinal anesthesia are as common as, and in some instances more common than, those following well conducted inhalation anesthesia. The use of spinal anesthesia will not decrease the incidence of postoperative pulmonary complications." Although the cough reflex is present, the ability to expel material from the tracheobronchial tree is impaired.

Respiratory paralysis due to high spinal anesthesia may occasionally occur with complete paralysis of intercostal muscles and the diaphragm. Even lower levels of anesthesia will result in partial paralysis of intercostal muscles with decreased tidal exchange, hypoxia, and carbon dioxide retention. If this respiratory embarrassment is accompanied by a rather severe degree of hypotension, the blood supply to the higher centers will be further diminished with imperfect oxygenation and depression of the respiratory center. Should this occur, artificial respiration with high concentra-

(Continued on page 254)

11. Burstein, C. L., and Rovenstine, E. A.: Respiratory parasympathetic action of some shorter-acting barbituric acid derivatives. J. Pharm. & Exper. Therap. **63**:42-50, 1938.

12. Moyer, C. A., and Beecher, H. K.: Effects of barbiturate anesthesia upon the integration of respiratory control mechanism. J. Clin. Investigation **21**:429-445, 1942.

13. Cullen, S. C.: *Anesthesia in General Practice*, ed 2 (Chicago: Year Book Publishers, 1948) pp. 149.

Factors That Enhance Safety during Anesthesia

John S. Lundy, M.D.*
Rochester, Minn.

The anesthetic agent of choice, as a rule, is the one in whose use the person who is to administer it is most skilled. It is almost supererogatory to point out that the patient should be safe while he is anesthetized.

Perhaps most of us rarely find ourselves in what I think is the proper frame of mind on this subject until we suddenly find that we ourselves must be operated on and be anesthetized. Then it becomes at once an extremely important matter. We ought to realize that such is the state of mind of practically every patient who contemplates anesthesia and operation. Among a number of other salient considerations the safety of the patient must be kept in mind constantly. The element of safety applies to the choice of anesthetic agent. When one must choose an agent and method, one should be able to say with confidence, "Even if it should happen that the patient does not survive it, I can think of nothing safer to suggest." Actually, such a variety of anesthetic agents and methods is available that it is possible to say that operation and anesthesia can be carried out for virtually any person with only a remote chance of an untoward result.

Contraindications to Use of Curare

Yet it is true that there are certain conditions that tend to place the patient in a group in which difficulties can be expected. If the condition of a patient is such as to place him in this group, then the nurse anesthetist should be quick to recognize it. Some rather outstanding examples may be mentioned. It is common practice now, for instance, to use curare to produce relaxation during anesthesia, particularly during light anesthesia. Nevertheless, there are at least two absolute contraindications to the use of curare. One is multiple sclerosis; the other is myasthenia gravis. Such a patient, who has very little muscle tone, requires only a small degree of anesthesia, and one must be very cautious in inducing it. A patient who has myasthenia gravis should receive prostigmine before anesthesia and operation are attempted.

Poliomyelitis

Another type of difficulty is represented in the patient who has had poliomyelitis and has a use-

Read before the Tri-State Assembly of Nurse Anesthetists, Chicago, April 28, 1952.
*Section of Anesthesiology and Intravenous Therapy, Mayo Clinic.

less upper extremity that is to be removed. Some of these patients cannot tolerate an ordinary dose of preliminary medication, not to speak of general anesthesia as well. It is a very serious matter to attempt to anesthetize such patients, who usually are children. Pulmonary ventilation must be arranged for, so that it can be carried out throughout the operation, together with sufficient supportive therapy to maintain circulation.

A patient who has been in an accident and is in a state of severe shock needs very little anesthesia. This is true, similarly, of a patient who has been badly burned.

Cardiac Disease

A patient who has known cardiac disease must be treated carefully. Care should be taken to insure that he is not underoxygenated. It may be necessary to use small doses of a digitalis derivative (cedilanid) intravenously. Sometimes, when cedilanid is not available, procaine hydrochloride or pronestyl is employed. Cyclopropane and a local anesthetic agent containing epinephrine are not regarded as suitable for a patient who has cardiac disease.

Gastric Hemorrhage

A patient who has undergone an operation on the stomach and in whom hemorrhage continues, with the result that corrective laparotomy must be performed, presents a very grave risk from many points of view. The chief risk I wish to emphasize is that involved in an attempt to induce anesthesia for such a patient, yet not to have the patient vomit and aspirate blood into his lungs, particularly when the blood is in clots. It is possible, however, to carry out venipuncture for the patient. A syringe containing pentothal sodium can be connected to the needle. Another syringe containing a solution of curare also can be connected to a four-way valve. Then, since the patient is rather weak, it may be desirable to fill the bag with 80 per cent nitrous oxide and 20 per cent oxygen, and to start a flow of 1 L. of cyclopropane per minute to reinforce this mixture. As the patient inhales the mixture, the respirations will become quieter and shallower until he is obviously well anesthetized. At that time a laryngoscope can be employed, intubation can be performed, and the injection of pentothal sodium and solution of curare can be started at once. If the tube inserted into the larynx and trachea is of adequate size, there will be little danger of the patient's aspirating any quantity of blood, and certainly no danger that he will aspirate clots. Such a procedure provides safer control of anesthesia for this type of patient than would be obtained by a slower means of induction.

Bronchiectasis

Another difficult problem in anesthesia is represented by the patient who has bronchiectasis and who is to undergo an operation on the diseased lung. In such an instance the operative position may require that the patient lie with his weight on the unaffected lung. The bronchial secretions of such a patient should be drained as extensively as possible before the operation starts. Intubation

should then be instituted with a fairly large intratracheal tube fitted with a connection that will permit repeated aspiration through the tube without disconnecting the whole system. By removing the patient's secretions and keeping the tracheobronchial tree as dry as possible, the anesthetist usually can maintain anesthesia satisfactorily through the whole operation without periods of serious underoxygenation. In this instance, placing the patient in moderate Trendelenburg position throughout the operation may be helpful in draining secretions from the respiratory passages.

Patients Treated with Cortisone

Recently, there has arisen a hazard that apparently had not been foreseen when the use of the adrenal cortical hormone, cortisone, was introduced. Let us suppose that a person has been treated with cortisone. Perhaps the treatment has been discontinued for a time, and then this patient is brought to the operating room for anesthesia and operation. In such a patient, as a result of the therapy with cortisone, the activity of the cortex of the adrenal gland may be suppressed, and it has not always been possible to decide when the cortex will reestablish a function that is adequate to maintain the patient through the unusual stress of anesthesia and operation. For this reason, it is wise to ask every patient, a number of days before he is to be anesthetized, whether or not he has been treated with cortisone. If he has, all possible information about the treatment should be obtained. Unless operation is required as an emergency measure, such a patient might need 100 to 200 mg. of cortisone intramuscularly daily for two to three days before operation, on the day of operation, and for two to three days after operation. Then the dose should be gradually reduced to an amount that is adequate to support the patient. Such a procedure ought to decrease the hazard of operation for the patient, previously receiving cortisone, who has not been treated or has been undertreated with cortisone in preparation for operation. When no opportunity exists for this type of preoperative treatment, a supply of adrenal cortical extract should be available, so that 50 cc. of it can be diluted and given intravenously at once, when needed, to be followed by intramuscular administration as indicated. Such other measures as are available may be used for the support of the patient.

It seems reasonable to assume that this particular hazard—lack of an adequate supply of cortisone when the anesthesiologist, surgeon, and internist may need it in a critical moment for certain patients—will increase as more cortisone becomes available and as it becomes cheaper. Certainly, the agent has been used experimentally in a great variety of conditions.

Fluid Therapy

Another problem that may present itself during anesthesia and operation involves the use of cross-matched blood of the proper group and possessing the proper Rh factor for the replacement of blood that is lost. When blood is

(Continued on page 246)

University Hospitals Anesthesia Studies of New Agents and Technics during the First Six Months of a Physician and Nurse Anesthetist Co-operative Program

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In our department we are responsible for more than 13,000 anesthesias each year. While in the great majority of our anesthesias the established and standardized agents—ethyl ether, nitrous oxide, pentothal sodium, procaine for local anesthesia, and pontocaine for spinal anesthesia—are utilized, we are in the process of evaluating recently introduced inhalation, intravenous, and local anesthetic agents as supplements and adjuncts to our established procedures. In some of these studies we are the primary investigators.

These agents include: trichlorethylene as an inhalation anesthetic and an analgesic, mephentermine (Wyamine-Wyeth) as a vasopressor agent, lidocaine (Xylocaine-Astra) as a local, extradural, and spinal agent; seconal sodium as a basal anesthetic and short-acting agent for intravenous induction of anesthesia; avertin as a basal intravenous agent preliminary to intubation and in peroral endoscopy; hexamethonium bromide as an agent for sympathetic ganglion block to combat hypertensive crises and as an agent to produce controlled hypotension in regulating bleeding in certain types of surgery.

With the Nation-wide shift towards an increasing number of geriatric patients, we have given considerable attention to the problem of this age group in such operations as hip pinning for fracture of the neck of the femur.

The purpose of this article is to summarize some of the advantages and disadvantages of these agents as revealed in our studies. It is our desire that this preliminary report will supplement your own initial studies of these agents and will assist you in the proper selection of patients and in the establishment of essential safeguards during the conduct of these anesthesias.

Trichlorethylene

Trichlorethylene is a pleasant and effective volatile anesthetic capable of promptly providing analgesia and basal sedation in obstetrics, dentistry, and change of burn dressings when used in con-

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centrations of 0.375 per cent to 0.5 per cent with air. It is best administered by a special inhalation apparatus, which regulates the rate of volatilization on the basis of environmental temperature. Light first plane anesthesia can be safely achieved with oxygen and concentrations of trichlorethylene approaching 1 per cent. It should not be used with soda lime. It is nonflammable at ordinary temperatures. It should not be used with epinephrine, but it may be successfully combined with nitrous oxide or a barbiturate administered intravenously.

Wyamine

This vasopressor agent was first developed at Western Reserve University for use in shock and hypotension associated with coronary thrombosis. For more than a year we have used it in more than 200 patients for the control of hypotension during either general inhalation or intravenous anesthesia. We have also used it to support blood pressure during conduction anesthesia. For an adult the usual intravenous dose varies from 15 to 30 mg. It is as promptly effective as ephedrine for fifteen to thirty minutes in about the same dosage. Apparently, no central nervous system stimulation is associated with its use. We did not have a single case of severe undesired hypertension in treating this large series of patients, most of whom were undergoing thoracic operations.

Xylocaine

Xylocaine is an agent from Sweden, which was introduced into America by one of us [Hingson] for local, caudal, peridural, topical, and spinal anesthesia. It is the most prompt and intense in local action of the presently used local anesthetic agents. During our daily schedule it is used as a topical agent for cystoscopy in four to ten cases and in surgery in at least four to eight cases. Its duration of action is about twice that of procaine, and its anesthetic potency is at least 50 to 100 per cent greater than that of procaine. As a local anesthetic agent it should not be injected in dosages greater than 0.5 Gm. per hour. We have noticed that it frequently produces a tendency to light sleep in addition to its local anesthetic qualities. This fact should be borne in mind when it is used in combination with nitrous oxide or pentothal sodium. We have used it without the occurrence of a reaction in many patients who were sensitive to procaine. However, an occasional patient has a specific sensitivity to this agent also. Consequently, barbiturates and fluids for intravenous administration and oxygen should be readily available to combat the occasional reaction.

Seconal Sodium

Intravenous induction of anesthesia with a barbiturate has gained favor rapidly during recent years. The pleasant sensation experienced by the patient is well appreciated. Since it is believed that vagal activity, manifested occasionally by laryngospasm, follows the use of the thiobarbiturates, we have been investigating the oxygen-containing barbiturates, such as nembutal and more recently seconal sodium, as hyp-

notic agents for intravenous administration.

Until quite recently seconal sodium could not be used to advantage as an intravenous agent. Rapid decomposition made its use impracticable. However, seconal sodium was used extensively in premedication by mouth and as a basal anesthetic agent administered rectally to children prior to inhalation anesthesia.

Since the advent of an improved solution of seconal sodium, now fully stable in a polyethylene glycol 600 vehicle, this agent is receiving attention in a half dozen American clinics, where it is being used as an induction agent for general anesthesia and to allay apprehension and to provide sedation during spinal, local, and other major types of conduction anesthesia.

In our department during the past two months we used seconal sodium intravenously in 115 instances in patients whose ages ranged between 6 and 85 years. Twenty-three of these patients received a good measure of sedation from 75 to 200 mg. seconal sodium to supplement spinal anesthesia; 92 patients received from 30 to 250 mg. seconal sodium as an induction agent. Three of these patients had a history of alcoholism, and 1 was a psychiatric patient requiring restraint because of agitation. All 4 of these patients were given 100 mg. seconal sodium in their own rooms before being taken to the operating room; 3 of them were definitely sleeping upon arrival in the operating room, and the fourth had no memory of the preoperative events immediately after the injection.

In only 3 of these 115 cases was there evidence of complications. Two patients became quite noisy and stimulated by the medication both preliminary to induction and upon emergence from anesthesia one and a half hours later. One woman, aged 23, who received 150 mg. seconal sodium preliminary to induction with nitrous oxide, oxygen, and ether, received an additional 100 mg. ten minutes later because of a slow induction; within two minutes apnea developed, and controlled respiration was required for an additional five minutes before respirations were reestablished.

Thus far we have concluded that seconal sodium in polyethylene glycol for intravenous use has proved satisfactory as an hypnotic agent to supplement spinal anesthesia and as a basal anesthetic agent preliminary to anesthesia. Administration is simple, and induction of general anesthesia is pleasant. Seconal sodium is compatible with curare preparations and can be used with the main inhalation anesthetic agents. Reduced amounts of cyclopropane and ether are needed when seconal sodium is used. Good relaxation of masseter muscles was obtained in all cases, and the induction time was shortened. There were no cases of increased vagal stimulation in this series.

Intravenous Avertin

The intravenous administration of avertin was originally used simply as an induction technic, approximately 45 to 60 cc. of either a 1 or a 3 per cent solution being given in the same way that pentothal sodium is given prior to general anesthesia by inhalation methods. It was first used in Ox-

ford, England, and was described by Macintosh and Pask[1] in 1941, but a more important contribution to the knowledge of this technic was published by Thornton and Rowbotham[2] in 1945. They described 264 cases, mainly of maxillofacial injuries, in which the solution was given as a continuous drip, either as a 3 per cent solution in physiologic saline or as a 1 per cent in 5 per cent solution of glucose. Both solutions are satisfactory, but the 1 per cent has a greater flexibility in use and dissolves more readily in glucose. In this strength it rarely causes thrombosis in brachial veins; this is a further reason to prefer the 1 per cent to the 3 per cent solution. The advantages claimed for the method are two: (1) early relaxation of the jaw so that laryngoscopy and intubation can be performed rapidly and without difficulty in patients who might have active hemorrhage into the mouth and (2) production of a lesser degree of laryngospasm than might be expected after the use of pentothal sodium.

Induction of anesthesia with avertin is pleasant, and recovery is comparatively rapid provided the administration is not carried on too long, but one must be constantly on the lookout for severe respiratory depression. Usually, the agent used by itself does not provide sufficient muscular relaxation for abdominal operations, and for this reason a muscle relaxant should be combined with it.

The only complication reported is mild transient hematuria, which subsides without treatment; there is no evidence of serious damage resulting from its use. A second possibility is primary cardiac failure, which is suggested on the grounds of the chemical relationship between tribromethanol and chloroform.

In our clinic we have used avertin intravenously in 20 cases, most of which have been endoscopies. In a patient with Ludwig's angina in whom tumefaction from the infection prevented opening the mouth and partially obstructed the airway, the intravenous administration of avertin in a 2.5 Gm. dose permitted blind intubation in nine minutes.

We have noticed that the masseter muscles are more easily relaxed and that there is less likelihood of laryngospasm with the use of avertin intravenously than with the use of pentothal sodium.

It is necessary, however, to use this technic only for patients with veins large enough to permit administration by a fast drip through an 18 gage needle to secure quickly an effective level of the drug in the circulating blood.

With intravenous administration the average dose of avertin required for surgical anesthesia permitting endoscopy and drainage of neck abscess and for induction and intubation varies between 2.5 Gm. and 4 Gm. for the average adult. In comparison with estimated dosage requirements of avertin for rectal administration to these same individuals, the dosage for intravenous administration was about one half as much. Furthermore, better control of depth of anesthesia could be obtained. However, a disadvan-

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1. Macintosh, R. R., and Pask, E. A.: Improved apparatus for continuous intravenous anesthesia. Lancet **2**:10, July 5, 1941.

2. Thornton, H. L., and Rowbotham, F.: Anesthesia in maxillo-facial surgical unit with British Liberation Army. Anesthesiology **6**:580-596, Nov. 1945.

tage we should mention is that 2 of our patients receiving 4 Gm. avertin were somnolent for four and six hours after operation.

Hexamethonium Bromide

Hexamethonium bromide and pentamethonium bromide or iodide have been accepted fairly widely in England as drugs for producing controlled hypotension during anesthesia. The popularity of the drugs can probably be attributed to the simplicity of their administration, although in practice the results are not always all that might be expected. In certain subjects a satisfactory decrease in blood pressure is not obtained even with large dosage. It is generally accepted that a blood pressure above 80 mm. Hg systolic does not appreciably decrease the amount of bleeding, and that ideally the systolic pressure should be maintained between 60 and 75 mm. Hg.

The commonest use for hexamethonium bromide is in the management of operations about the ear, face, thyroid, and breast. Since postural drainage of the operation site is as essential as the exhibition of the drug, the sphere of usefulness of hexamethonium bromide is somewhat limited. In most cases anesthesia is induced with pentothal sodium, although sometimes curare, nitrous oxide, and oxygen are used, and intubation is performed. The patient is placed in position so that the operative site is slightly above the rest of the body, and hexamethonium bromide is then administered intravenously. The dose to be used varies, and it is difficult to give a more specific dosage range than between 20 to 50 mg. The dose may be repeated as often as needed, although second and subsequent doses are usually much smaller than the initial one. It is also recognized that if curare is being used a much smaller amount is needed to achieve the same result when a methonium compound is administered. A decrease in blood pressure to 60 to 80 mm. Hg is to be expected within three or four minutes; this pressure is usually maintained for about forty-five minutes but may in certain cases last much longer. If a dangerous decrease in blood pressure results, lowering the head of the table and administering desoxyephedrine produce immediate, and nearly always satisfactory, responses.

The postulates of Gillies concerning the decrease in peripheral resistance and the lowered head of pressure apply to the use of this drug in the same way as they do to total spinal anesthesia. The main danger in the method lies in asphyxia if a proper airway and adequate oxygenation are not maintained, and if a dangerously low level of blood pressure is permitted to persist for a long period.

Our early experience emphasizes that the following prerequisites are absolutely essential in the proper management of controlled hypotension by pharmacologic block of sympathetic ganglia with hexamethonium bromide: (1) a good airway, good respiratory exchange, and administration of a high concentration of oxygen; (2) the presence of a large bore needle in a good vein to permit an immediate increase in circulating blood volume by intravenous administration of fluids; (3) availability in a syringe of an effective vasopressor drug, such as

desoxyephedrine, should a hypotensive crisis develop; and (4) the selection of patients without arteriosclerosis, cardiac disease, or kidney disease.

In addition to using this agent for the production of controlled hypotension, we have used it as a therapeutic agent to control hypertensive crises. The following case is illustrative:

A well preserved man, aged 73, with a blood pressure of 140 mm. Hg systolic and 90 mm. Hg diastolic was given a spinal anesthetic of 8 mg. pontocaine and 5 per cent dextrose for prostatectomy. Simultaneously, he was given an intramuscular injection of 25 mg. ephedrine. The blood pressure remained stable for more than an hour. Then, as the anesthesia started to wear off, the pressure rose to 290 mm. Hg systolic and 160 mm. Hg diastolic; the patient had precordial pain and a throbbing headache. When these symptoms persisted for ten minutes, a test dose of 5 mg. Bistrium was injected to reduce the pressure to 260 mm. Hg systolic and 140 mm. Hg diastolic; five minutes later an additional 5 mg. Bistrium promptly reduced the pressure to 130 mm. Hg systolic and 80 mm. Hg diastolic, where it remained for the next two hours.

As is true of other methods for producing controlled hypotension, there is a considerable danger that the surgeon may demand a bloodless field in a number of cases in which such a refinement is unnecessary. Although this is of no moment provided a skilled anesthetist is available, the method will necessarily fall into disrepute when it is forced on junior anesthetists who are not competent to manage such cases. Even though use of hexamethonium bromide has achieved more popularity than other methods for controlling the blood pressure, it is still viewed with some suspicion. The use of the methonium compounds should, therefore, not be regarded as a standard anesthetic procedure.

SUMMARY

The anesthetic methods and agents described have been studied in the United States only during the past six months. We present this preliminary information as a progress report only.

SAFETY

(Continued from page 240)

not lost and anemia has not existed previously, the plasma volume-expanders can be used, or the so-called plasma substitutes, such as 6 per cent solution of dextran in isotonic solution of sodium chloride, 3.5 per cent solution of polyvinyl pyrrolidone in Ringer's solution or a similar solution, or 5 per cent solution of gelatin can be employed. These agents provide circulating volume in the cardiovascular system, and maintenance of circulating volume is one of the most important factors in the treatment of circulatory collapse.

As a matter of fact, when loss of blood is average and the degree of shock is not out of the ordinary, I find that I get better results by the alternate use of a bottle of blood and a bottle of solution of dextran, polyvinyl pyrrolidone, or gelatin than by the use of either blood or one of these agents alone. Each plasma expander performs a function that is different from that performed by the blood.

SUMMARY

The foregoing illustrations concern some of the more prominent factors that must be considered to make conditions as safe as possible for the anesthetized patient.

Clinical Experiences with Trichlorethylene in General Anesthesia for Dentistry

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Although trichlorethylene has been used for many years in industry as a detergent and degreasing agent, it was not until the investigations of Hewer[1] during World War II that it was used extensively as a general anesthetic agent. Since that time it has become very popular in Great Britain and Canada for obstetric analgesia and for surgical procedures requiring only a light plane of anesthesia.

I was first introduced to the advantages of trichlorethylene for dental procedures through the work of Axelrod of Miami, Fla., who had been using it for some time. At the dental dispensary of St. Vincent Charity Hospital we use a product bearing the trade name of Neurolene and have employed it successfully since 1949 in approximately 3,000 cases.

Chemistry

Trichlorethylene is an unsaturated hydrocarbon chemically akin to chloroform. It is a clear fluid with a sweetish odor. Specific gravity is 1.47; boiling point 87 C. It is not flammable in any concentration when mixed with air. Trichlorethylene decomposes when exposed to strong light or air and should be kept tightly stoppered in a dark container. It is unstable in the presence of soda lime at temperatures above 15 C. and is therefore unsuitable for use in a circle filter or other re-breathing apparatus. Serious nerve palsies have been reported due to the impurities formed by contact with soda lime.

Pharmacology

Trichlorethylene is nonirritating to the respiratory tract and does not change blood chemistry or increase capillary oozing. It is not toxic to the liver or kidneys.[2] Cardiac irregularities are thought to be the result of overdosage or the use of the agent with a soda lime-absorption technic. Bradycardia is the most frequent complication and is considered to be due to vagal stimulation.[3] The commonest respiratory complication is rapid, shallow breathing, which is a sign of overdosage. Nausea and vomiting are rare.

*Read before the Annual Meeting of the Ohio State Association of Nurse Anesthetists, Cleveland, April 1, 1952.

Associate Dental Staff, St. Vincent Charity Hospital.

1. Hewer, C. L.: Trichlorethylene as general analgesic and anesthetic. Proc. Roy. Soc. Med. 35:463-468, May 1942.

2. Jackson, D. E.: A study of analgesia and anesthesia, with special reference to such substances as trichlorethylene and Vinesthene (dizinyl-ether), together with apparatus for their administration. Anesth. & Analg. 13:198-203, Sept.-Oct., 1934.

3. Gain, E. A.; Yates, M., and Watts, E. H.: Obstetric anesthesia using nitrous oxide-oxygen-trichlorethylene. Anesth. & Analg. 30:279-284, Sept.-Oct., 1951.

Technic of Administration

Trichlorethylene is unsuitable for use by the open drop method because of its low volatility. Any standard model dental machine can be adapted for the use of trichlorethylene by the addition of a small, dark glass, wickless vaporizer. A wick should never be used, since it increases the concentration of the vapor. Nitrous oxide-oxygen is used as a carrier for the vapor, and the gases are flowed, never bubbled, over the trichlorethylene. Sufficient oxygen should always be employed to avoid any trace of cyanosis.

The patient is seated comfortably in the dental chair in a semireclining position, and a mouth prop is properly placed between the teeth. The controls of the gas machine are set to deliver 80 per cent nitrous oxide and 20 per cent oxygen. Average minute volume and millimeters of pressure are used. A nasal inhaler is placed over the nose with the exhaling valve open, and the patient is instructed to breathe through the nose. A gauze pack is placed over the mouth.

As soon as the patient loses consciousness, the trichlorethylene is added gradually until anesthesia is established. The percentage of oxygen is then increased to 35 to 50 per cent. The mouth is opened, and a gauze pack is inserted to eliminate oral breathing and to prevent aspiration of blood and mucus.

On completion of the operation the administration of trichlorethylene is discontinued, and 100 per cent oxygen is administered until the first conscious movement is manifest.

In the management of the obstreperous patient the pressure should be increased and the oxygen concentration decreased without increasing the flow of trichlorethylene.

The signs that anesthesia is suitable for the dental procedure are (1) equal inhalation and expiration, (2) normal pulse rate, (3) roving eyeballs, and (4) normal color. The signs of overdosage are (1) rapid, shallow respirations, (2) tachycardia or bradycardia, (3) pupils fixed in the midline, and (4) cyanosis.

In our experience with the administration of trichlorethylene to unpremedicated outpatients we have found it to have the following advantages: (1) it is safe, pleasant, and efficient; (2) it is an antispasmodic; (3) there is no increase in capillary oozing; (4) recovery is rapid; (5) a high concentration of oxygen may be used in the mixture; (6) the equipment and technic are simple; (7) the agent is economical; (8) it is nonexplosive.

Since only a small amount of the drug is needed for a single case, the cost of anesthesia is relatively low. The rapid recovery and the infrequent occurrence of nausea and vomiting afford a quick turnover of patients, which is an important factor in the handling of outpatients.

Summary

A report is given of the use of trichlorethylene for general anesthesia in 3,000 dental procedures. It has been found effective, economical, and safe for outpatients. The importance of a high oxygen concentration and the dangers of contact with soda lime are emphasized. It is especially valuable in the management of the resistant patient.

Advantages of Membership in the American Association of Nurse Anesthetists

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I am assuming that what I am supposed to do this afternoon is to try to prove to those of you who are members that you are getting full value for your dues in the A.A.N.A. and, if there are any nonmembers present, to point out how much better off they would be if they joined us.

The reasons that lead professional people to join associations are not too obvious. It is true that there is a tendency today for people to seek the prestige that comes from belonging to a group that just anybody can't join. Membership in an association tends to set a person apart and to give him an identity that he wouldn't otherwise have. While this motivation may be unconscious, there are definite satisfactions in being one of the chosen. Often a person seeks membership in an association because he is urged to do so by other members. Trying to qualify for membership becomes an acceptable thing to do. Unfortunately, the positive reasons for joining an association are too often not well thought out beforehand, and, as a consequence, the member may feel discontented with what the association apparently has to offer. Emphasis is placed on "What do I receive?"; whereas, the fact is that in belonging to an association one has to give to get. Therefore, the two major divisions of my subject today will be, first, what the A.A.N.A. gives to its members and, second, what the members can give to the Association.

As a starting point, let us look at the situation of the nurse anesthetist in 1930, the year before the A.A.N.A. was organized. There were a few local organizations of nurse anesthetists at that time, mostly in cities, and at least one state association—that in California. The intracity groups got together mainly for the purposes of good fellowship—for the stimulation of interest that comes from meeting with persons who are doing the same work. And may I say here that, so far as the personal development of a professional worker is concerned, such stimulation of interest is one of the basic values of membership in an association. The state association in California had a more definite purpose than that of promoting good fellowship. In California at that time nurse anesthesia was in danger, and the California nurse

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anesthetists organized to present a solid front of opposition to anti-nurse anesthetist activity in that state.

However, throughout the country generally in 1930 no provision was made for nurse anesthetists to meet and discuss their common problems under the auspices of an association. They had no united front to present in the face of threatened adverse legislative activity. There was no means whereby prospective nurse anesthetists could find out about the relative merits of the training programs in the schools of anesthesia. A hospital administrator or a surgeon had no way of knowing whether a nurse anesthetist employed by him was adequately prepared for the job. There was no instrument for supporting the continuous learning process that is necessary to any professional worker. Nurse anesthetists as a body had no means of communicating with other professional groups. The public was almost totally unaware of the valuable service that individual nurse anesthetists were rendering.

How has this been changed by the fact that there is now a respected national association of nurse anesthetists?

From the early 1930's until the present time the Association and its legal advisors have forestalled numerous attempts to introduce bills adverse to the interests of nurse anesthetists into state legislatures. Anti-nurse anesthetist legislation has assumed various disguises. For example, a bill introduced into the California legislature would have restricted the penetration of human tissues to physicians and would have prevented nurses from administering all types of subcutaneous, intramuscular, and intravenous medication, including intravenous anesthetics. A bill to amend the New York Education Law would have eliminated nurse anesthesia in that state by the process of attrition. Every nurse anesthetist has benefited by these efforts on the part of the Association. For the passage of a bill affecting the administration of anesthesia by nurses in even one state would open the gates to similar legislation in other states. The problem of legislation is a matter that cannot be handled by individuals. It requires the financial backing and strength of numbers of an association.

In the legal field the work of the Association has not been restricted to legislative activity alone. The legal advisor of the A.A.N.A. is available for consultation on any problem of a legal nature that could affect the Association and its members. In this same connection, I would call your attention to the fact that A.A.N.A. members may now obtain malpractice insurance. I would also like to point out that originally *only* nurse anesthetists who belonged to the Association could get this type of insurance. Insurance companies could not take the risk of insuring persons whose qualifications to practice were not established by a recognized organization.

From its inception the A.A.N.A. has gradually but consistently raised the standards of education in the schools of anesthesia. This has been done by basing eligibility requirements for membership on educational criteria and by the institution of a qualifying examination for membership and the

recently approved accreditation program. Both the qualifying examination and the accreditation program were conceived as methods for raising educational standards for nurse anesthetists at the time the Association was organized. The qualifying examination, which was instituted in 1945, has the specific purpose of measuring the competency of nurse anesthetists applying for membership. The accreditation program, which was approved by the Board of Trustees in January 1952, has the wider aim of stimulating schools of anesthesia to improve their teaching programs by offering them assistance and by putting a stamp of approval on schools of merit.

If it weren't for these efforts on the part of the A.A.N.A., nurse anesthetists of ability and superior educational background would have no true professional standing. There would be no way for one to distinguish the casual anesthetist from the anesthetist who is a postgraduate specialist. Having been chairman of the national Credentials Committee for a number of years, I am personally aware of what this means. In the early days of the Association the Credentials Committee sometimes had to decide arbitrarily whether or not an applicant deserved the protection of membership in the A.A.N.A. Your association can now assure you that you belong to a carefully selected group of professional women and men. From a practical standpoint, you need only look at the classified ads in the JOURNAL to see what membership in the A.A.N.A. means to hospitals wishing to employ nurse anesthetists.

When we nurse anesthetists look upon ourselves as professional people—as a select group of postgraduate specialists in nursing—we assume certain responsibilities that are only the obligations of professional workers. One of these responsibilities is continuously to improve the quality and quantity of service that we as a professional body offer to the public. We have the responsibility not only of stimulating those teaching nurse anesthetists to give them the best possible education, but also of steering potential students to schools of anesthesia that will educate them properly. We can't do either of these jobs as individuals. As individuals we have no way of knowing the relative merits of teaching programs in the schools of anesthesia. As individuals we also have no way of reaching the oncoming generation of nurse anesthetists as a group. But as an association we can discharge both of these obligations and do it effectively. Perhaps some of you have wondered what the emphasis on the Association's educational program is all about. You have doubtless asked yourselves how it affects you, and why so much of the Association's effort has been concentrated on schools of anesthesia. The answer is that in so doing the Association is performing an essential job for you that you as individuals cannot perform yourselves.

Perhaps no body of knowledge is changing so rapidly as that which supports advancements in science, and in none have the changes been so dramatic as in medicine. Many of the discoveries in medicine directly or indirectly affect the work of anesthetists, and all of them have the aim of increasing the protection and pres-

ervation of human lives. If we as nurse anesthetists are to fulfil a moral as well as a professional responsibility to patients, we cannot stop learning when we leave our studies in a school of anesthesia. The learning process must be continuous. What does and should the Association do in this connection? First, it sponsors meetings, such as this assembly, to which are brought authorities to talk to you about the latest developments in anesthesia. It sponsors institutes with the American Hospital Association. These institutes are open to anesthetists in member hospitals of the A.H.A. as well as to members of the A.A.N.A. and are refresher courses in the sense that emphasis is placed on basic scientific and technical knowledge necessary to practicing anesthetists. The Association also publishes a JOURNAL and a NEWS BULLETIN, both designed for the particular professional needs and reading interests of nurse anesthetists. In all these ways the Association strives to keep alive the nurse anesthetist's interest in improving herself professionally.

Of immeasurable value to the A.A.N.A. member is the close relationship between the American Association of Nurse Anesthetists and the American Hospital Association. Since the first convention in 1933 the A.A.N.A. has held its annual meeting with the American Hospital Association, and there is an increasing tendency for both state and regional affiliates to meet jointly with state and regional hospital assemblies. The facilities for meetings that the nurse anesthetists are able to obtain as a result of this connection are in every way superior to those that they would be able to obtain without the sponsorship of the hospital groups. The hospital people at national and regional conventions see the nurse anesthetist as a member of a respected organization rather than as a lone person without any professional identification. In many situations nurse anesthetists as a group have the support of the American Hospital Association—a support that it would be impossible for the individual nurse anesthetist to obtain. Contacts that the Association has with other national professional organizations have similar value in advancing the interests of nurse anesthetists, and here again the contacts are such that they could not be made by individuals.

In the field of public relations the Association has worked to increase the public's awareness of the service being offered by nurse anesthetists throughout the country. In the publication of brochures about anesthesia as a career for professional nurses, in newspaper releases, and in releases to professional journals the Association stresses the exclusive character of membership in the A.A.N.A. While the esteem that you receive in your own community is largely determined by the quality of your personal public relations, it is nevertheless enhanced by the fact that you are members of a vital national organization.

Up to this point I have emphasized the advantages of membership in the national association. In many respects these same advantages are to be found in membership in state and regional affiliates. There are, however, additional advantages to active participation in the affairs of the affiliated groups.

For it is in these groups that the individual learns the technics of being a participating member. All of us must at some time learn the principles of group activity that lead to the satisfactions of accomplishment. It is not necessarily true that a good committee is made up of three persons—one out of town and another home sick in bed. For good group activity, there must be an understanding of how people get along together and of why they sometimes don't. Leaders must be developed, and the difference between a good leader and a bad one must be recognized. Standard procedures, particularly parliamentary procedure, must be learned in order that the association's business may be conducted in a fair and orderly manner. It is in the local organization that you have the opportunity to acquire this valuable type of knowledge, which will serve you in good stead not only in association work but also in your professional life.

We now come to the matter of what the members can give to the Association in order that they may get the most out of their membership. Being a member of an association is like being a member of a team—by way of illustration, a surgical team. You wouldn't expect to have an effectively functioning surgical team if the scrub nurse, circulating nurse, or even anesthetist had periodic attacks of "Monday morningitis" and didn't show up for work. You wouldn't expect a good result if the instrument nurse didn't take the trouble to learn the instruments required by the surgical procedure or failed to have them ready when needed. I think you know what happens to tempers when the demands of one person can upset a whole operating schedule. For good teamwork in the surgery you must have people who know their jobs, who feel the responsibility for performing in harmony with the other members of the team, and who are on hand prepared to work when needed.

An association requires similar attributes in its members. If you don't attend meetings, you are failing in the same way as if you didn't show up for "duty." If you glibly say, "Yes, I'll be a candidate for office, or be responsible for the program, or serve on a committee," and then not take the trouble to learn what is required of you or to do what is required at the proper time, you can throw the whole team operation out of gear.

The key to good teamwork in an association lies in the wise selection of your leaders—your officers and your trustees. They should be chosen as carefully as you would choose the directors of a corporation in which you had your life's savings. For it is they who control the funds, formulate the policies, and appoint the personnel on committees to carry on the association's business. Good officers not only know their own jobs but also know how to direct committee activities, with the result that programs are well planned, the membership is kept well informed, and interest in attending meetings is heightened.

Even with good leaders, however, an association cannot be effective unless the individual members co-operate. Someone has to do the work, and every member should be willing to take a turn. If you possibly can, say, "Yes,"

when you are asked to be a candidate for office or serve on a committee. But before you say, "Yes," be sure that you are in a position to do what is required of you. On the other hand, if you know you can't do the work, don't hesitate to say, "No." Nothing is more disrupting to the smooth functioning of an association than the failure of committee personnel or officers to follow through on an assignment.

The third thing that the members can give to the Association is a high level of performance in their professional lives and public relations. The Association sets high eligibility requirements for membership so that you may be assured of the caliber of your associates in your professional organization. In turn, it only asks that you live up to similarly high standards in doing your work and in meeting the public. It is unfortunate but true that unethical behaviour on the part of even one member reflects on the whole association. The best place to build up an active awareness of the importance of good professional and public relations is in the local groups and in your home communities. Recent graduates taking their first jobs in a strange community are inclined to fall into the habits of the older anesthetists. In this connection, bad habits in apparently small matters can add up to an appalling total. Unbecoming familiarity, small indiscretions in keeping confidences, gossiping, and common behaviour in public places all lower the esteem of the profession in the eyes of the hospital staff and the public. A valid complaint of hospital administrators is the lack of consideration on the part of some nurse anesthetists in applying for and leaving positions. Not only does such irresponsibility give the individual a bad name among administrators, but it also reflects on the profession and should be actively discouraged in the local groups whenever it crops up.

From a purely personal point of view, one of the most gratifying advantages of membership in the Association is the opportunity to be a visitor to a meeting such as this and to get together with other nurse anesthetists in a professional home away from home. For wherever there is an association of nurse anesthetists, a strange member need never feel isolation upon moving to or visiting a new community. The local group will see to it that the newcomer is made welcome and pitches in to make the Association the best possible representative of a splendid profession.

RESPIRATION

(Continued from page 237)

tions of oxygen and measures to counteract the hypotension are indicated.

Summary

A review of the modern concept of the physiology of the respiratory system is presented. The effects of the volatile anesthetics upon the respiratory system are discussed. Special emphasis is placed upon applied physiology to pathologic states resulting from anesthesia. The inherent hazards of barbiturate and spinal anesthesia upon the respiratory system are emphasized.

Survey of Personnel Practices for Nurse Anesthetists

Josephine Bunch, R.N.*
Portland, Ore.,
and
Minnie V. Haas, R.N.*
Fort Worth, Texas

A preliminary survey of personnel practices for nurse anesthetists in the United States was made by the Personnel Practices Committee of the A.A.N.A. in 1951. As stated in the report of that survey,[1] "The difficulties that hospital administrators have had during recent years, not only in obtaining nurse anesthetists but also in evaluating the relative attractiveness of the situations offered, plus the efforts of nurse anesthetists in certain areas to formulate a standard for personnel practices, led the Board of Trustees of the American Association of Nurse Anesthetists to appoint a committee on personnel practices in 1949. The function of the committee was to obtain data on prevailing personnel practices and from the data to attempt to set up a standard of reference."

Because it was realized that the small sampling of the 1951 survey did not constitute an entirely valid study, a more extensive survey, the subject of this report, was authorized. Early in 1952 a questionnaire was sent to 887 nurse anesthetists who were selected from the membership list of the A.A.N.A. in such a manner as to avoid duplication of information from a single hospital. Of the 406 questionnaires returned, 46 were rejected for incompleteness, and 360 reports were used in the study.

The data requested on the questionnaire were essentially the same as those requested in the 1951 survey with certain additions and included: (1) number of beds in the hospital, (2) salary range, (3) maintenance — room, board, and laundry—and cash value put on maintenance, (4) hours on duty, (5) hours on call, (6) vacation days, (7) sick leave days, (8) annual health examination, (9) health insurance and hospital's contribution to premium, (10) time schedules, (11) rules for dismissal, (12) written personnel policies, (13) number of persons administering anesthesia, and (14) number of anesthesias administered.

The returns were analyzed to obtain national averages according to hospital size (see table). When the salary range included, as it did in some instances, a

1. Personnel practices committee report. A.A.-N.A. News Bull. 5:18-19, Oct. 1951.

*A.A.N.A. Personnel Practices Committee.

bonus for overtime, paid call, or a percentage of fees, only the basic salary range was used in the computation, and no night call was charged to hours of work. An eight hour day was computed to be a forty-eight hour week, and when hours on call and hours on duty were reported as one figure, the basic work week was considered to be forty-eight hours.

Comment

Extreme variations were found in all aspects of the survey, both within the groupings of hospitals according to bed capacity and at the national level. However, in interpreting these extremes some weight should be given to variations in economic conditions in different regions, the relative availability of anesthetists in different communities, and the employment of anesthetists on a part-time basis.

Although in interpreting averages conclusions should be drawn with caution, certain trends in personnel practices for nurse anesthetists were apparent in this survey. With respect to benefits the trend seemed to be towards higher salaries, more maintenance, liberal vacations and sick leave, and an extension of health insurance coverage. However, the increased benefits on the average served to highlight severely substandard conditions in some hospitals.

A fairly consistent trend was noted towards a forty hour week of duty. But an opposite tendency was apparent in the hours per week spent on call. In interpreting the fact of increasing hours on call for nurse anesthetists, consideration must be given to the possibilities (1) that more hospitals may be relieving the anesthetists from duty in the surgery after the schedules are completed, with the result that a decrease in hours on duty would be offset by an increase in hours on call, and (2) that the shortage of anesthetists has made inroads on the availability of anesthetists for call duty exclusively.

The anesthesias administered per anesthetist varied widely from a previously computed average of 685 a year. Most noticeable were the waste of the anesthetists' ability in the small hospital and the comparatively high efficiency in the 100 to 249 bed group.

The two areas in personnel practices for nurse anesthetists calling for the most needed improvement were (1) the annual health examination and (2) written personnel policies.* The stress of anesthesia service is such that an annual health examination for anesthetists, particularly a chest x-ray, should be looked upon as a protection for both the hospital and the anesthesia staff.

A study of the printed personnel policies obtained from hospitals in connection with this survey revealed a general lack of consideration for the specific employment conditions inherent in anesthesia service. With a view to aiding hospital administrators in formulating personnel policies for nurse anesthetists and to improving personnel relations among anesthetists and other hospital employees, the following statement of principles was formulated and adopted by the Board of Trustees of the A.A.N.A.:

*In tabulating the data on the questionnaires, credit was given for "written personnel policies" even though a copy was not available; a goodly number were "at the printer's."

National Averages for Personnel Practices for Nurse Anesthetists*

Size of hospital Hospitals reporting	1-49 beds 23	50-99 beds 81	100-249 beds 136	250 beds and over 120	Average†
Salary	$350.15	$350.27	$343.75	$336.86	$345.26
Range	$190-500	$200-800	$206-560	$130-600	
Maintenance					
Room	52%	50%	59%	40%	50%
$	$25.75	$20.46	$23.19	$26.10	$23.88
Range	$4-55	$10-50	$10-50	$10-60	
Board	70%	74%	58%	42%	61%
$	$39.63	$34.01	$32.37	$32.28	$34.57
Range	$10-100	$10-90	$10-50	$12.50-65	
Laundry	70%	69%	63%	62%	66%
$	$8.30	$6.38	$7.81	$6.90	$7.35
Range	$5-20	$1.50-15	$4-20	$3-15	
Hours on duty	41	39	40	43	41
Hours on call	96 (no call 4%)	71 (no call 10%)	47 (no call 10%)	19 (no call 29%)	58 (no call 14%)
Vacation days	16	19	21	21	19
Range	7-30 (none 4%)	10-30 (none 2%)	14-30	14-31	
Sick leave days	11 (none 13%)	11 (none 16%)	12 (none 9%)	13 (none 6%)	12
Annual health examination	39%	42%	37%	52%	43%
Health insurance	91%	86%	95%	90%	91%
Paid by hospital	26%	30%	20%	27%	27%
Posted time schedules	43%	75%	77%	90%	71%
Rules for dismissal	43%	63%	63%	67%	59%
Written personnel policies	22%	32%	35%	50%	35%
Persons administering anesthesia	1.6	1.95	3.46	11.2	
Anesthesias administered	424	1405	3226	7239	
Range	300-1489	500-3369	152-9203	1907-24,000	
Anesthesias per anesthetist	265	721	932	646	

*Figures rounded out to the nearest whole number.

†This average is of the average for the various size hospitals.

A.A.N.A. Statement of Principles Regarding Personnel Policies for Nurse Anesthetists

Most hospitals have established policies covering employee relations, and in most respects these apply to nurse anesthetists employed by hospitals. Such general policies should be understood by the nurse anesthetist at the time of employment and adhered to.

There are, however, certain special employment conditions inherent in anesthesia service. It is the purpose of this statement of principles on personnel policies to call attention to the personnel problems that arise from certain characteristics of anesthesia service, and to offer some general suggestions for the guidance of nurse anesthetists and their employers in making necessary adjustments.

The special employment conditions in anesthesia service are (1) the twenty-four hour service, (2) the unequal daily work loads, (3) the irregular hours, (4) the anesthetists as a minority group in the hospital, (5) the divided responsibility of the anesthesia staff to the administration of the hospital and to the surgical staff, (6) the necessary availability for call duty, and (7) the stress of the service beyond that of many other types of nursing.

In the light of these facts, the following recommendations are made by the A.A.N.A. with respect to a pattern for personnel policies for nurse anesthetists.

Channels of authority.—Because of the distinction between the professional and the administrative problems of anesthesia service, two channels of authority should be recognized: (1) one to the medical (surgical) staff and (2) one to the hospital administrator. The head of the anesthesia department should have direct access to these authorities.

Work schedules.—The posting of time schedules contributes to harmonious conditions in a department of anesthesia. In planning the schedules there should be an equalization of unencumbered time among the members of the staff and adequate provision for rest after a period of duty or call. The scheduling of unnecessary "emergency" operations should be reduced to a minimum.

Hours.—While the goal of a forty hour week is much to be desired, the shortage of nurse anesthetists makes it impracticable at the present time. Nurse anesthetists accept the fact that call duty in addition to regular duty is inherent in the service. For this reason, those nurse anesthetists who must take night call should not be expected to remain on duty after the operating schedule is completed merely to satisfy an arbitrary hospital regulation. The reason for this apparent favoring of nurse anesthetists should be clearly explained to other hospital personnel.

Salaries.—Because of the need for nurse anesthetists to cover both the regular and emergency anesthesia service and to be available for duty in excess of that required by the rest of the nursing staff, the compensation should be adjusted accordingly.

Resignations.—A minimum of anesthesia service is essential if a hospital is to fulfil its responsibility to the community, and the nurse anesthetist is under obligation to give formal notice of resignation and take into con-

sideration the difficulties of replacement. The A.A.N.A. recommends that one month's notice be given, or such notice as shall be reasonable under the circumstances, provided such notice does not conflict with the policies of the particular hospital.

Vacations.—Adequate vacations and time off for attendance at professional meetings contribute to the ultimate good of the anesthesia service in the hospital.

Health program.—The nature of the work in anesthesia is such that it would be advisable for hospital administrators to insist on periodic health examinations, particularly chest x-rays.

Living quarters.—Special consideration should be given to the provision of comfortable living quarters for nurse anesthetists because of the time spent in their quarters on call. Of primary importance is the provision of a telephone in the anesthetist's room.

Equal in importance to hospital policies in creating harmonious conditions within the department of anesthesia is the acceptance of certain responsibilities by the employed anesthetist. The A.A.N.A. supports the principles of the highest professional ethics for nurse anesthetists. These cover their responsibility to be available for scheduled duty and call, not to take advantage of the shortage of anesthetists to make unreasonable demands on the hospital, and to maintain professional standards of the highest order even though it may mean some sacrifice of personal time and comfort.

My Gift

To the Agatha Hodgins Educational *Loan* Fund

I hereby donate $_____to the Agatha Hodgins Educational Fund, which is "designed to extend financial assistance to graduate nurse anesthetists in obtaining further education and training to become qualified instructors, or to instructors who desire and need additional training to become better qualified."

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Address_____

Checks should be made payable to: American Association of Nurse Anesthetists, for Educational Fund, and sent to: American Association of Nurse Anesthetists, 116 S. Michigan Ave., Chicago 3, Illinois.

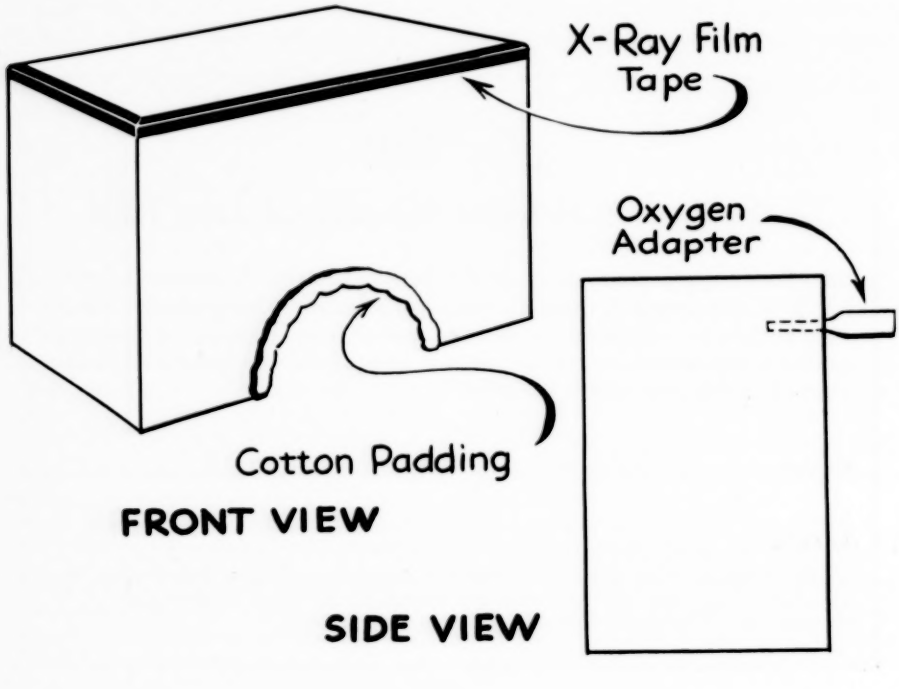
Notes and Case Reports

Improvised Oxygen Tent for Infants.—An oxygen tent for children can easily be made by using an empty 500 cc. solution cardboard box. After the top and bottom are cut off the box, a large or small blank but developed x-ray film is placed on the top of the box to overlap on the sides and is held in place with tape. A hole is then cut in the front of the box to fit the patient's neck snugly but not tightly. This arch is then padded with cotton, which is secured with tape.

The oxygen inlet is taped in the upper back part of the box. Any type of glass connector can be used for this purpose. The oxygen hose fits almost any adapter.

The box can be used flat on a large bed, and it exactly fits an infant nursery crib. A most important factor is that there are no leaks between the box and the bed. If necessary the box can be taped to the bed, and the child can still be turned from side to side. A humidifier can be attached to the oxygen tank.

I have used this technic on several infants with very efficient results—**Sarah Margaret Robbins, R.N.**, Taylor, Tex.



Anesthesia for Delivery of Twins by Cesarean Section.—The patient was a well developed woman, aged 29, para 2, gravida 3, who was admitted at full term. She had no history of miscarriage, and the youngest child was 13 years of age. The indication for cesarean section was breech presentation of both babies.

The patient was admitted to the hospital the evening before operation and was given nembutal, gr. 1½, for sleep after the routine laboratory examinations had been made. The next morning nembutal, 100 mg., was given hypodermically one and one-half hours before operation. At 10:00 a.m. 18 mg. pontocaine weighted with glucose was given between the third and fourth lumbar vertebrae after injection of 50 mg. ephedrine sulfate with novocain as a skin wheal. Anesthesia was established to the costal margin, and the incision was made at 10:05 a.m. Blood pressure reading was 160 mm. Hg systolic and 80 mm. Hg diastolic; pulse rate was 100 a minute and respiratory rate 20 a minute. The patient was mildly apprehensive although co-operative and fairly well composed.

At 10:08 a.m. a boy was delivered. He cried spontaneously and was removed from the operative field after having had his throat aspirated and the cord clamped. At 10:09 a.m. a girl was delivered. Her throat was aspirated, and she cried with little encouragement. Both babies were of good color, required no resuscitative measures, and appeared to be normal in every respect.

After delivery of the babies the mother was given pentothal sodium, 300 mg., and nembutal, 150 mg., intravenously for sleep, and

the uterus and abdomen were closed with catgut and skin clips according to standard procedure. Blood loss was minimal, and the operation was completed at 10:27 a.m. Pituitrin, 1 cc., was given into the uterus after the placenta was peeled off the uterine wall, and ergotrate, 1 cc., was given intravenously as the uterus was being sutured. Time of the placenta was 10:10 a.m.

Since there was little fluid loss, the use of intravenous supportive therapy was not deemed necessary. The patient made an uneventful recovery and was discharged on the eighth postoperative day.—**Phyllis A. Roberts, R.N.**, Jefferson, Iowa.

Legislation

Death of Newborn Infant Held Due to Fall Through Delivery Table.[1]—An action was brought against a hospital for the death of a newborn infant. It was alleged that the child fell through a hole in the delivery table at the time of birth. The hole was usually padded with rubber, with a very small opening left for drainage. On this occasion there was no padding.

The court held that the evidence warranted the finding by the jury that the death of the newborn infant resulted from a blow on the head suffered in the fall of the infant through the hole in the delivery table at the time of birth, and that the hospital had been negligent in connection with such fall.

Jury Could Draw Its Own Inferences As to Negligent Treatment of Patient.[2]—Scarring occurred to the patient's leg, it was alleged, as a result of warm compress treatment applied to the infected area of the limb by nurses who were employed by the hospital. The patient contended that the scarring spoke for itself and no medical evidence was necessary to prove it was due to the negligent treatment. There was some question as to whether the scarring was caused by negligence or whether it occurred as a normal and natural result of the necessary treatment or of osteomyelitis and blood poisoning.

These questions, said the court, were for the jury to decide as questions of fact. The burden was on the patient to make out a case from which the jury, on the basis of experience, might draw the conclusion that negligence was the most likely explanation. For the purpose of the patient's proof, he did not need medical evidence; the jury could draw its own inferences.

Cause of Injuries to Patient in Hospital Held To Be Question for Jury.[3]—The proof on behalf of the patient showed that she entered the hospital for two successive operations, neither of which had any relation to her feet. Her feet were perfectly normal. Each of the operations lasted about forty-five minutes; during the second operation her feet were suspended in straps without the straps' being released or loosened. She claimed that the blood circulation was thereby impaired and gangrenous sores developed on each leg. There was also proof that her own private duty nurses applied hot water bottles, which could have caused the injuries.

The jury was instructed by the court to determine whether or not her injuries were caused or contributed to by the negligence of the hospital nurse in applying the straps or in permitting them to remain for such a period of time

(Continued on page 277)

1 Hord v. National Homeopathic Hospital, 102 F. Supp. 792—D. C.

2. Milias v. Wheeler Hospital, 241 P. 2d 684-Calif.

3. Palmer v. Clarksdale Hospital, 57 So. 2d 473-Miss.

Abstracts

SECHER, OLE: The peripheral action of ether estimated on isolated nerve-muscle preparation. II. Synergism of ether and curarising substances. Acta Pharmcol. et Toxicol. 7:83-93, 1951.

"The object of the present investigation has been to analyse the synergistic interaction of ether and curare, as well as to find out whether a difference is demonstrable between the actions of curare, flaxedil and decamethon together with ether. . . . The technique . . . is based on the use of Bülbring's phrenic-diaphragm preparation [from rats]. . . . It is concluded that the synergism of ether and curare probably depends on a simple additive action and not, as previously supposed, on a potentiation of the two actions. The results of the experiments argue greatly in favour of the view that ether acts chiefly on the muscle end-plates. There seems to be no fundamental difference between the mode of action of ether-curare and that of ether-decamethon, as previously supposed. The ether seems to act together with flaxedil in the same manner as with the other substances."

SECHER, OLE: Muscular contractures of isolated nerve-muscle preparation produced by peroxide-containing ether. Acta Pharmacol. et Toxicol. 7:94-100, 1951.

"In a previous series of experiments, in which the response of the isolated nerve-muscle preparation to neostigmine was investigated, while the preparation was under the influence of ether (Secher 1951), a few of the experiments proved to differ essentially from the rest. The muscular contractions were not increased by addition of neostigmine when the ether administration was discontinued. Examination of the ether used revealed traces of peroxide which might, perhaps, explain this irregular action. . . . As they are explosive in pure form peroxide-containing ether is not harmless. The peroxides are polymerisation products of unknown chemical constitution. . . . The present investigations have shown that a preparation of an isolated muscle is sensitive to ether peroxides and that these substances may cause irreversible changes in the muscle. The peroxides must be biologically very active toxic substances. After addition of 3 mg. peroxide, corresponding approximately to a 0.01% solution in the chamber (about 30 ml.), the muscle is brought into a state of irreversible [change]. . . . It is conceivable that formaldehyde is produced inside the muscle. The contracture caused thereby would then be due to denaturation of the proteins."

MASCARO, JOSEPH, AND BISHOP, H. F.: Use of curare in facilitating endotracheal anesthesia and for the relief of laryngospasm. New York State J. Med. 50:1381-1382, June 1, 1950.

"The purpose of this paper is to report experiences with the use of curare in endotracheal anesthesia and in the treatment of laryngospasm during the administration of various anesthetic

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*U. S. Pat. 2587744, March 4, 1952

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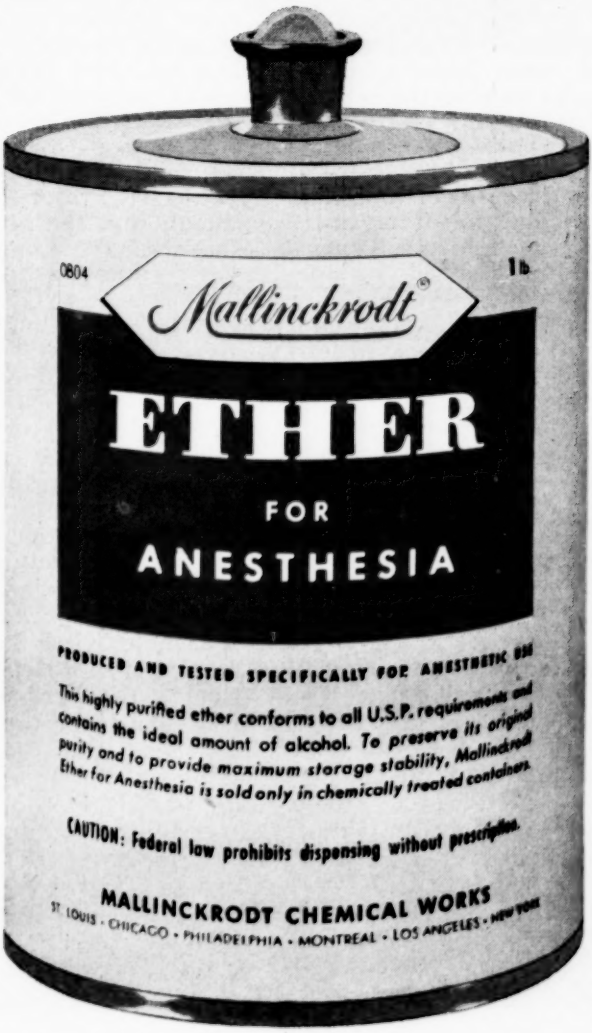
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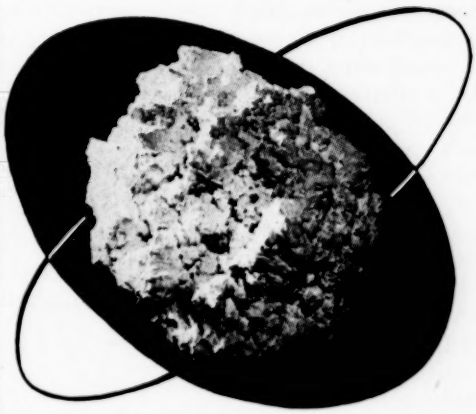
agents to adult patients undergoing major surgery. The duration of the surgical procedures in this series ranged from two to six hours. The series includes 36 patients. Induction with sodium pentothal was either moderately rapid, using 2.5 per cent solution, or by the slow intravenous drip method, using 0.2 per cent solution. . . . A dose of curare, calculated to produce diminished intercostal respiratory movements, was then administered. The dose for adults ranged from 40 to 100 units, the usual dose being 60 units. . . . As soon as the activity of the intercostal muscles was diminished or abolished efficient artificial respiration, by means of the face mask and breathing bag, was carried out for from thirty seconds to three minutes. This interval of time allowed for adequate relaxation of the jaw. The mask was removed, and the oral endotracheal catheter was inserted under direct vision with the laryngoscope. The relaxation that follows the intravenous injection of curare usually makes intubation with an oral endotracheal catheter an easy maneuver. . . . In six patients intravenous curare was used for the treatment of laryngospasm during surgical anesthesia. . . . In all but one, there was definite relief of laryngospasm in one to one and one-half minutes. The initial dose of 40 units usually relieved the spasm. In a few cases, where moderate relief was obtained, a second dose of 30 units was given to relieve the spasm completely. In one patient in which relief was not obtained, it was subsequently discovered that the patient was obstructed from excessive tracheobronchial secretions. Laryngospasm was reduced following tracheal aspiration."

Li, T. H.; Jacobs, B. R.; Aviado, D. M., Jr., and Schmidt, C. F.: Early respiratory depression by curare and curare-potassium antagonism. J. Pharmacol. & Exper. Therap. **104**:149-161, Feb. 1952.

"The widespread use of curare and its derivatives to produce muscular relaxation in anesthesia appears to be based to a considerable extent on the belief that the muscles of respiration are more resistant to the drug than those of the abdominal wall and limbs. . . . In experiments in which curare was given to dogs or cats while recording the response of a leg muscle to stimulation of its motor nerve as well as the respiratory movements of the thorax, the latter frequently showed marked depression before the former was appreciably altered (single twitches). The present study was undertaken to analyze further these unexpected and surprising findings. . . . Dogs 9 to 20 kgm., cats 2 to 3 kgm., and rabbits 2 to 4 kgm. were used. . . . It has been shown that early thoracic respiratory depression can occur in mammals with chloralose anesthesia but not with other anesthetics, following a comparatively small dose of curare which is too weak to diminish the single twitch tension of a non-respiratory skeletal muscle, although the Wedensky inhibition is shown to be profoundly intensified and the post-tetanic facilitation to be more permanently and strikingly abolished. Intocostrin and *d*-tubocurarine show the same depressant effects but dihydro-β-erythroidine displayed some minor difference in dogs. The underlying mechanism is not central, but a peripheral effect on



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the intercostal muscles, and the apparently unaffected single twitches are in interesting contrast to intensified Wedensky inhibition and abolition of post-tetanic facilitation. This respiratory depression is easily antagonized by eserine and K^+. The widespread impression that the respiratory muscles are relatively resistant to curare therefore is unjustified as far as the intercostal muscles of dogs, cats and rabbits are concerned, though it probably is still valid for the diaphragm."

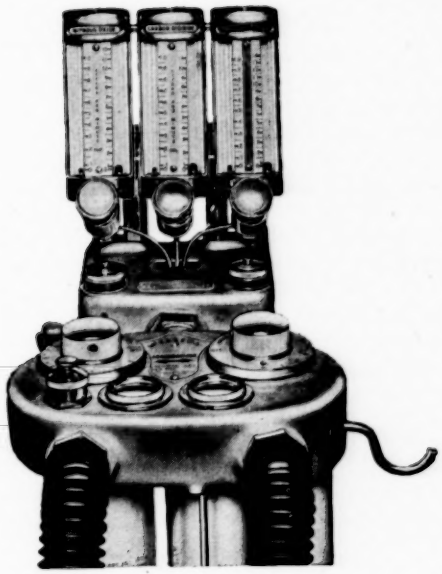
LEVY, R. L.: Oxygen in cardiac infarction. Bull. New York Acad. Med. 26:394-401, June 1950.

"Infarction of the myocardium results from narrowing or occlusion of a coronary artery. The commonest cause of such pathologic changes is atherosclerosis. . . It is not necessary to administer oxygen to every patient with a cardiac infarct. But even though the clinical picture at the outset may appear to be mild, extension of a thrombus or the occurrence of pulmonary edema or an arrhythmia may cause sudden and grave changes. It is therefore desirable to have the required apparatus always readily available on short notice. . . . For prolonged therapy, the modern tent is the most comfortable and effective way of administering oxygen. . . . Not all of these beneficial effects are to be anticipated in every case; but not infrequently an apparently hopeless situation shows a sharp turn for the better and improvement can be dated from the first day on which oxygen was given. . . . The length of time that oxygen administration should be continued, as in the case of indications for its use, defies precise definition. It will vary in each patient. A fair average might be given as one week."

LEFFINGWELL, F. E.: Choice of anesthesia in heart disease. Ann. West. Med. & Surg. 4:244-247, May 1950.

"The question of whether a patient with cardiac disease will survive the strain of anesthesia and surgery is one which should be resolved only by close consultation between surgeon, cardiologist and anesthesiologist. . . . Because of the patient's consciousness of his abnormal heart condition, special effort must be made to win his confidence and relieve his apprehension. . . . Sedation should be to that degree which will result in a state of euphoria and indifference without depression. . . . The practice of evaluating the degree of sedation just before the patient leaves his room is time-consuming but will pay dividends. . . . In patients whose hearts already have some disturbed function of the conduction system the period of induction is most critical. It is during this time that adrenalin secretion is apt to be highest. . . . Throughout the course of the anesthesia there is no single factor so important as the continuous maintenance of the oxygen saturation of the blood at its highest possible level. . . . A patent airway must be secured early and constantly maintained. . . . The effort which a patient with cardiac disease expends to ventilate himself must be kept at a minimum. . . . Malpositions during surgery must be avoided. . . . Second in importance only to anoxia is the need for preventing drops in blood pressure. . . .

"Cyclopropane possesses many characteristics which make it desirable for anesthetizing patients with cardiac disease. . . . However, it is a universally accepted



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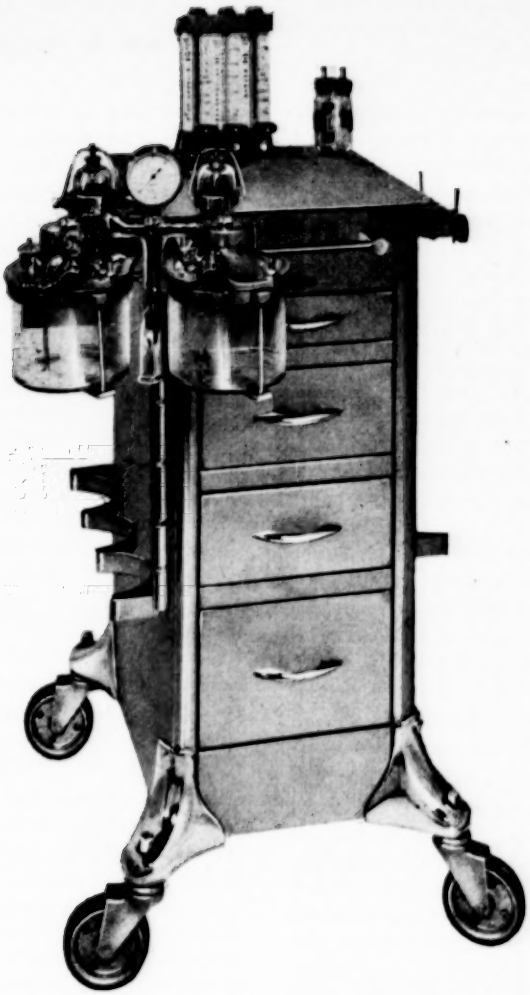
fact that cyclopropane sensitizes the conduction system so that even small quantities of epinephrine may initiate very serious arrhythmias. . . . Nitrous oxide and ethylene, unsupported by other agents, are ruled out in anesthesia for cardiac patients because of the relatively low concentration of oxygen admissible in effective anesthetic mixtures. Likewise, Pentothal alone is unsuited because its lack of analgesic properties demands dosages which are dangerously depressing to respiration. . . However, the introduction of curare has given us a technic whereby even cardiac patients can now be anesthetized safely by well balanced combinations of nitrous oxide, oxygen and Pentothal with curare providing the relaxation. . . Regional blocks and local infiltration carry little risk if performed skillfully and without causing pain or mental trauma. These procedures should be supplemented with light Pentothal-nitrous oxide-oxygen amnesia. In reviewing the pharmacologic effect of ether on the heart and circulation one is impressed with certain desirable features. . . . The induction with ether is slow, unpleasant, stormy, and for the cardiac patient is fraught with danger. This can be obviated by inducing with Pentothal, nitrous oxide and oxygen, gradually adding ether to the desired concentration. There seems little excuse for a straight ether induction in modern anesthesia."

La Salvia, Lucy A., and Steffen, Elizabeth A.: Delayed gastric emptying time in labor. Am. J. Obst. & Gynec. **59**:1075-1081, May 1950.

"On the obstetrical service of the Woman's Hospital [Philadelphia] we observed that about 40 per cent of all patients vomited either during or immediately following obstetrical inhalation anesthesia. The vomitus often consisted of food ingested several hours prior to the time of delivery. This fact suggested a delay in the emptying time of the stomach during labor, and prompted the following study. . . . A group of seventy-five patients was selected from our prenatal clinic, and the studies were carried out over a period of four months. All were either gravida i or gravida ii, in the last trimester of pregnancy. Special test meals of carbohydrate, fat, and protein were used together with a barium-water mixture (3 ounces barium, 8 ounces water), as a tracer, for the purpose of determining gastric motility by serial x-rays of the stomach. . . . Of the original seventy-five patients selected for this study, only forty-two could be followed completely. . . . All patients were delivered under spinal anesthesia or local pudendal block. Oral feedings were withheld, except for the test meal, and intravenous fluids substituted in labor. . . .

"We can conclude that: 1. Pregnancy alone has little or no effect on the emptying time of the stomach. Sedation (Demerol 100 mg., and scopolamine 1/150 grain) decreases gastric motility. . . . In labor with sedation as above, there is a more marked delay in the motility of the stomach, than with sedation alone, showing that labor is definitely a factor. . . . This study shows that there is a definite delay in gastric emptying time in sedated women in labor; that this favors vomiting during obstetrical anesthesia, and, on occasion, inhalation of this vomitus with subsequent morbidity or even death. It recommends that



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such complications be avoided by withholding oral feedings and substituting intravenous therapy in women in labor unless they are to be delivered under spinal or local anesthesia. In this way, one serious preventable complication of delivery can be avoided."

Dripps, R. D.: A comparison of the malleable needle and catheter technics for continuous spinal anesthesia. New York State J. Med. **50**:1595-1599, July 1, 1950.

"The single-dose technic of producing spinal anesthesia imposes a time limit upon the surgeon, regardless of the anesthetic agent administered. . . . Continuous (fractional or serial) spinal anesthesia was welcomed on its introduction in 1940 by Lemmon, who suggested use of a malleable needle left in position during the operation. In 1945, Tuohy modified the technic by inserting a catheter 4 to 5 cm. into the subarachnoid space. These two methods have enjoyed widespread and deserved popularity. So far as we know there have been no published data comparing these two methods. In this paper we plan to compare them primarily from the standpoint of technic. . . . In this clinic, from 1943 to 1950, the malleable needle method was used 1,107 times in 1,005 patients and the catheter 506 times in 488 patients. . . . The data appear to warrant the following views: 1. More failures can be expected with the catheter technic than with the malleable needle method. 2. The catheter technic should be regarded as potentially more traumatic than that with the nonrigid needle. 3. Neither method should be used unless an absolute indication exists."

Bittrich, N. M., and Rangatore, J. S.: Spinal anesthesia in obstetrics. Am. J. Obst. & Gynec. **62**:1314-1320, Dec. 1951.

"We like to consider the use of spinal anesthesia in obstetrics under four classifications: 1. Therapeutic use of spinal anesthesia. 2. Use of spinal anesthesia for surgical interference. 3. Use of spinal anesthesia for analgesic purposes. 4. Use of spinal anesthesia for terminal or actual delivery. . . . Spinal anesthesia serves a twofold purpose in the treatment of toxemia if the uterine ischemia theory of Page is followed. Hypertension is controlled and blood supply, as well as oxygenation of the syncytial elements in the uterine wall, is increased. . . . It is important not to administer a spinal anesthetic in the presence of severe anemia. . . . Because most cesarean sections are terminated in one hour, more or less, we use a single dose of spinal anesthetic agent. Immediately following the delivery of the infant almost any drug may be administered to the nervous patient for the purpose of sedation. We commonly use intravenous morphine or Pentothal Sodium. . . . The level of anesthesia required is to the umbilicus. Pontocaine is our anesthetic agent of choice. The spinal tap is done in the second lumbar interspace. For the good-risk patient 0.6 cc. of 1 per cent Pontocaine (6 mg.) is mixed with 0.6 cc. of 10 per cent dextrose. . . .

"The poor-risk patient receives a smaller initial dose of Pontocaine. . . . In the use of spinal anesthesia for analgesic purposes, a long duration of analgesia without cessation of uterine motor activity is required. This necessitates anesthesia to the eleventh dorsal vertebra. . . . We have had good results in the control of postspinal headaches by the intrave-

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nous injection of 0.1 per cent procaine administered according to the technique of Graubard and Peterson. . . . In our experience spinal anesthesia properly used has proved a relatively safe procedure for therapeutic, surgical, analgesic, or terminal delivery of obstetrical patients. With the exception of a mild case of meningitis there have been no unfavorable sequelae. These spinal anesthetics, which approximate 6,000, were administered for the most part by the obstetrical residents, all of whom had a three-month training period in the Department of Anesthesiology."

BABBAGE, E. D., AND BELLAS, J. J.: Anesthesia for emergency surgery following massive upper gastrointestinal bleeding. New York State J. Med. **50**:1600-1601, July 1, 1950.

"While much has been written from the surgical viewpoint in the past few years concerning immediate or emergency surgery following massive upper gastrointestinal hemorrhage, little discussion concerning the problems in anesthesia in such cases has taken place. This paper will cover a carefully recorded series of 106 such cases. Surgery was performed on 64 of these. To be included in this series a patient has to fulfill the following criteria: A. Gross evidence of bleeding within past week. B. Red blood cell count of 2,500,000 per cu. mm. or less, or total circulating red cell volume 60 per cent of normal or less. C. Reasonably good evidence for the diagnosis of peptic ulcer. D. At least 2.5 L. of blood available. E. Adequate surgical facilities at hand. . . . In this series, 92 per cent were operated upon within twenty-four hours of admission, and the other 8 per cent within forty-eight hours. . . . There have been seven deaths in 64 operative cases, giving a mortality of 10.9 per cent. In the control group of nonoperated cases, there have been nine deaths in 42 cases, giving a mortality of 21.4 per cent. The control group consists of patients who fall into the above category but who refuse surgery. . . .

"Blood volume studies have been done on every case in this series, both preoperatively and postoperatively. Preliminary investigative work has shown that the time-honored methods of determining blood loss—namely hematocrit, red cell count, and hemoglobin determinations—give a false picture as to the exact status of the patient. Hematocrit reading alone does not reflect the true degree of hemorrhage until twenty-four hours have elapsed. By utilizing T-1824 dye in determining plasma volume, a reasonably accurate reading of the red cell volume can be obtained. When the red cell volume is known, a yardstick is established for replacement needs with whole blood. However, a note of warning must be interjected at this point. Even though laboratory work shows a lack of circulating red blood cells, clinical judgment and observation must be used at all times in order to forestall overloading the circulation. This overloading is made evident by distention of veins and a rapid unexplained rise in blood pressure. Later, pulmonary edema may develop. . . . There is no need to wait until a normal blood pressure and pulse have been established; these can be secured during the progress of surgery. Pentothal, ether, and oxygen are desirable anesthetic agents."

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Book Reviews

A Review of Nursing. By Helen F. Hansen, R.N., M.A., formerly Educational Director, University of California School of Nursing, San Francisco; Inspector, Schools of Nursing, State Department of Public Health, California; Assistant Director, Mount Sinai School of Nursing, New York City; Chief, Bureau of Registration of Nurses, California; Executive Secretary, Board of Nurse Examiners, California; Director, Sacramento Junior College School of Nursing, Sacramento. Ed. 7. Cloth. 844 pages. Philadelphia: W. B. Saunders Co., 1952.

This familiar publication, now in the seventh edition, has been revised to include new drugs and treatments. In addition to nursing procedures, the subjects of public health, both national and international, and sociologic aspects of nursing are included. An outline of the subjects is followed by a large battery of questions to be answered. Emphasis is placed on the situation-type question, although other types are included.

Magic in a Bottle. By Milton Silverman, Ph.D., Science Editor, San Francisco Chronicle. Cloth. 386 pages. New York, The Macmillan Co., 1951. $4.25.

This is a popular history of some of the persons who were instrumental in developing drugs that have become part of treatments common in modern medicine. The stories of each drug or group of drugs are fascinating reading, and those on morphine and anesthetics will be of special interest to readers of this journal. To introduce the story of drugs to the lay person and to present the romance behind the fact to those who administer drugs, this book will be of singular value.

Simplified Arithmetic for Nurses. By M. Esther McClain, R.N., M.S., Instructor in Nursing Arts, Providence Hospital School of Nursing, Detroit. Paper. 151 pages. Philadelphia: W. B. Saunders Co., 1952.

Although the author says that "Arithmetic needed for preparing doses of drugs and solutions made from drugs is not difficult," it seems that many nurses do prefer having a reference available, especially when seldom encountered problems arise. It is in this connection that graduate nurses may find the best use for this book. With the contents well outlined and the problems clearly stated, the book should be of great value for all nurses.

The Encyclopedia of Nursing. Lucile Petry, M.A., R.N., Chief Nurse Officer, United States Public Health Service. Cloth. 1011 pages. Philadelphia: W. B. Saunders Co., 1952.

The fabulous task of compiling an encyclopedia of nursing merits the admiration of the reader. All phases of nursing education are included. The volume is arranged in two column, dictionary style, but the entries are much more detailed than mere dictionary definitions. In the preparation of a volume such as this, one can understand how an occasional item such as the one on "anesthetist" would contain data more than five years old. It is apparent that such outdated items are the exception and should not detract from the general usefulness of the book.

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NEUROSURGICAL NURSING. By Walter G. Haynes, B.S., M.D., Diplomate American Board of Neurological Surgery; Fellow of the American College of Surgeons; Fellow of International College of Surgeons; Attending Neurosurgeon Baptist Hospitals, East End Memorial Hospital, South Highlands Infirmary, Jefferson-Hillman Hospital, Birmingham, Ala., and Mary McGuire, R.N., M.A., Clinical Supervisor, Neurological Service, Kings County Hospital, Brooklyn, N.Y. Cloth. 178 pages, 56 illustrations. Philadelphia: W. B. Saunders Co., 1952.

As surgical technics become increasingly specialized, so too does the need for specialized knowledge by the nurse increase. This text is specifically designed to help nurses to understand the importance of nursing care to the success of neurosurgical procedures. Anesthetists intimately involved in the care of this group of patients will appreciate this book in which the special problems are presented.

No particular chapters on the subject of anesthesia are included, but the entire text will be found useful in a better understanding of the many phases of neurosurgical nursing.

LEGISLATION

(Continued from page 262)

as to cause the injuries, or whether her own private nurses who applied the hot water bottles were responsible for the condition. In finding in favor of the hospital and against the patient, the jury was held to be within its rights; the evidence justified a finding that either the straps or the hot water bottles could have caused the injuries. — EMANUEL HAYT, LL.B., Counsel for A.A.N.A.

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WANTED: Anesthetists, three; 450 bed teaching hospital. Department directed by medical anesthesiologist, staffed by medical resident personnel, and six nurse anesthetists. Southern city with cultural advantages. $350 per month with full maintenance. Periodic increases in salary. Liberal vacation and sick leave. Apply: C. A. Robb, Superintendent, Roper Hospital, Charleston, S. C.

NURSE ANESTHETISTS: For approved general hospital. Must be able to administer latest types anesthetic agents. Salary $310 to $360 per month plus full maintenance. Annual vacation and sick leave. Retirement benefits if desired. Apply: Superintendent, Robinson Memorial Hospital, Ravenna, Ohio.

NURSE ANESTHETIST: 250 bed general hospital. Starting salary $300 per month plus full maintenance, vacation, sick leave, and holidays. Apply: Ohio Valley Hospital, Steubenville, Ohio.

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WANTED: ANESTHETIST NURSE for new 200 bed AMA and ACS approved general hospital; department headed by anesthesiologist; salary open, dependent upon experience. Write: B. W. Mandelstam, M.D., Administrator, Mount Sinai Hospital, Minneapolis, Minn.

WANTED: Two nurse anesthetists for new 130 bed hospital. Salary $300 to $325 and full maintenance, based on experience. Apply to: Administrator, Pitt Memorial Hospital, Greenville, N. C.

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NURSE ANESTHETIST: Female. Southern city. Voluntary hospital, 130 beds. Good salary and maintenance. Apply: Administrator, North Louisiana Sanitarium, Shreveport, La.

NURSE ANESTHETIST: County general hospital. $350 per month plus meals on duty and laundry of uniforms. Medical Director, Duval Medical Center, Jacksonville, Fla.

NURSE ANESTHETIST: For two-doctor clinic in middle Tennessee, town of 7500. Salary open. Option: can also work as private nurse for one of the doctors. Apply: Patrick Clinic, Box 813, Fayetteville, Tenn.

WANTED IMMEDIATELY: Obstetrical nurse anesthetist. Department covered by three with 2,000 deliveries per year. Apply: Director of Anesthesia, Henry Ford Hospital, Detroit, Mich.

NURSE ANESTHETIST (A.A.N.A. member): 70 bed hospital, forty miles from San Francisco. Salary $325-$350 per month plus $5 each case when on call; hospitalization insurance and Social Security. Forty hour week, maintenance available. Write: Administrator, Pittsburg Community Hospital, Pittsburg, Calif.

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ANESTHETISTS — Nurse: Three immediate vacancies; minimum starting salary $350 with full maintenance; increases every six months first two years. Experienced nurse anesthetists, starting salary $400 with full maintenance. 115 bed general hospital, six miles from downtown Washington, D. C. Apply to: Administrator, Arlington Hospital, Arlington, Va.

WANTED: Nurse anesthetist, in new five million dollar 300 bed, teaching hospital in Texas Medical Center. Salary $375 to $400 with periodic increase. Two physicians and up to eight nurses in department. No maintenance. Apply: Dr. P. H. Chalmers, Anesthesiologist, Methodist Hospital, Texas Medical Center, Houston, Tex.

NURSE ANESTHETIST: 40 bed general hospital. Salary $400 per month. Vacation, sick leave, and social security available. Apply: Superintendent, Jasper County Hospital, Rensselaer, Ind.

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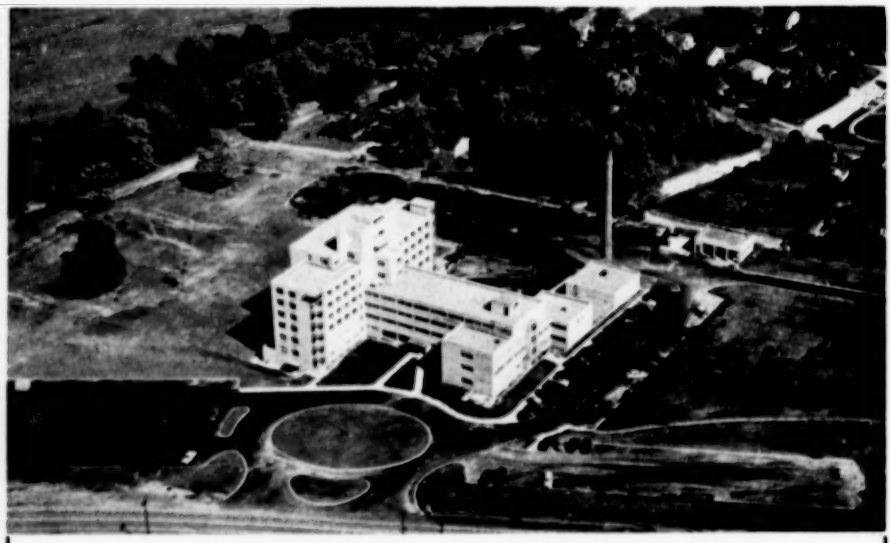

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